the OIL AND GAS JOURNAL

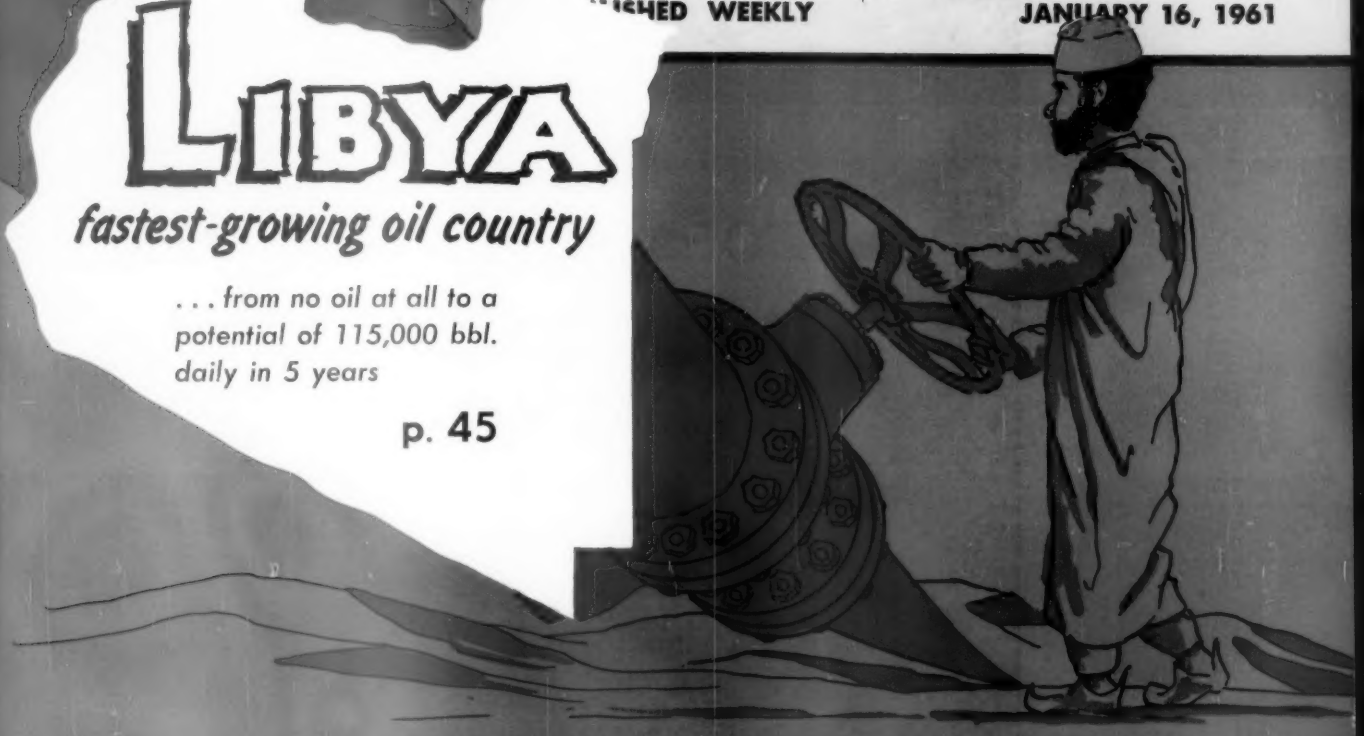
...ISHED WEEKLY JANUARY 16, 1961

LIBYA

fastest-growing oil country

. . . from no oil at all to a potential of 115,000 bbl. daily in 5 years

p. 45



Oil companies must diversify to stay successful

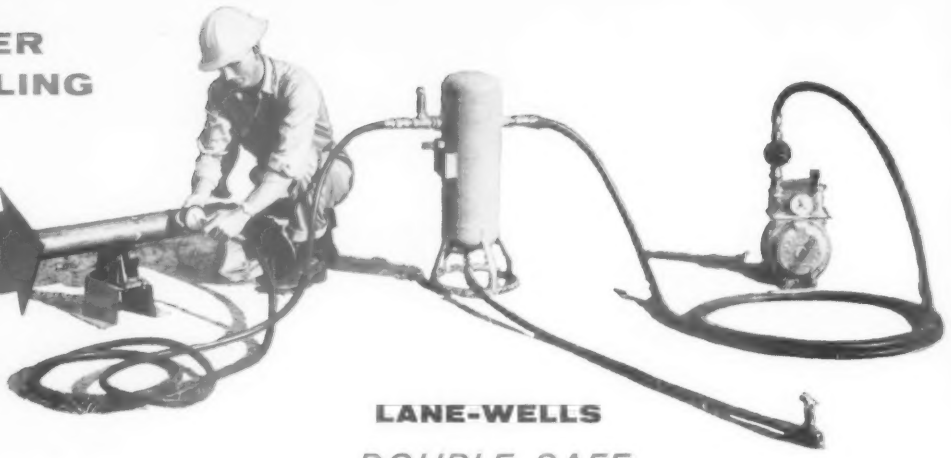
. . . says Shell's new president in a Journal interview ▸ 56

Four major discoveries give 1961 a good start ▸ 52

World proration: Solution to ruinous surpluses? ▸ 68

An advance look at a new basin — Chama ▸ 122

SAFER, SURER FLUID SAMPLING



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FORMATION TESTER

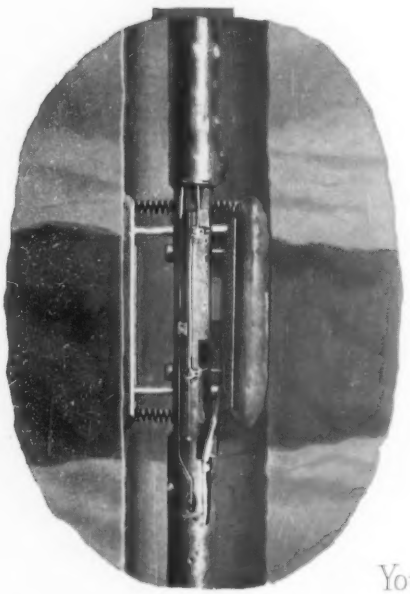
- Complete film record of hydraulic, formation and hydrostatic pressures.
- All valves operated electrically from surface.
- Two equalizer valves for positive release.
- Two part sampling for accurate interpretation with safety.

The Lane-Wells wire line Formation Tester obtains both formation fluid samples and valuable pressure data with a new level of safety never before possible.

This tool may be used at any time during drilling. It is positioned by correlation with an SP curve. After the sealing pad and back-up shoe are set and held by hydraulic pressure, access of the formation is obtained by means of a Koneshot charge.

When the sample is obtained and sample chamber closed, the pad is retracted by releasing hydraulic pressure, the tool withdrawn and sample transferred through high pressure hose to a calibrated separator and gas meter. The measured quantities of fluids and gas provide an index to the production potential of the formation tested.

A complete film record of hydraulic pressure in the sealed section, formation flowing and shut-in pressures and hydrostatic pressure of the borehole fluid provide additional valuable information.



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OIL AND GAS JOURNAL
Vol. 59, No. 3

Contents January 16, 1961

THE WEEK'S NEWS

General Interest:

Libya—World's Fastest Growing Oil Area 45
Complicated Arrangement Moves Mexican Crude Into Texas 47
FPC Defends Its Record, Calls for New Gas Law 48
Tax Rules for Operating Units Published by IRS 49
Newest Oil Publication to Appear This Week 54
Shell President Sees Diversification as Key to Success 56

Pipelining:

Despite Rival Threat, Transco Moves Ahead With LPG Line Plans .. 60
Pipeline Briefs 60
New Device Promises Better Process Control 62
Plastic Line Will Move Gas to Vancouver Island 62

Processing:

Progress in Knock-Testing Methods Outlined at SAE Meeting 50
Mid-Continent Refinery Realizations Top Gulf Coast 51
Processing Briefs 58

Drilling-Production:

Antenna Proposal Would Bind Drillers in More Red Tape 48
Court Ruling Near on Use of Trespass Law to Block Fracturing 50
Texas May Outlaw Small-Tract Drilling 58
New Instrument Checks Casing Corrosion—Outside and Inside 59
Shell Makes Underwater Completion Off Louisiana 60
Alaskan Gas May Generate Power for Anchorage Utility 62

Foreign News:

Satellites Get No Oil Bargains From Russia 64
Gulf of Paria Drilling Suspended 65
Russia Will Shoot for Record Crude Output in 1961 65
Delhi-Taylor Spuds First Deep Panama Test 65
Soviet Rigs Will Help Develop Syrian Field 66
Foreign Briefs 66

Exploration:

Four Significant Strikes Get 1961 Off to a Good Start 52
Oil Men Will Learn Plenty From the Mohole Project 119
Shallow Production Possibilities Spark Chama Basin Drilling 122

REGULAR FEATURES

Advertisers' Index 141
Calendar of Events ... 37
Classified Advertising . 139
Drilling Contractors .. 116
Drilling Statistics 135
Editorial 43
Equipment Men 112
Exploration Highlights 119
Foreign News 64
Foreman's Page 90
Journally Speaking ... 41
Markets 138
New Equipment 107
On the Job—Pipelining 103
Personals 130
Process Costimating .. 92
Production 136
Refining Statistics 137
Statistical Summary .. 134
The Journal Said 41
They Say 35
Trade Literature 111
Watching Washington . 49
Who's Who in Oil 130

Technology-Operation section on next page ⟶

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TECHNOLOGY—OPERATION

General

World Proration: Would It Solve the Surplus Problem? 68
By M. J. Sladic
International proration would allow some of the world's most underdeveloped nations to take advantage of their immense oil reserves to move toward self-sufficiency. And it would protect the oil industry from ruinous and crippling surpluses.

Refining-Processing

Computer Helps Atlantic Handle Refinery Butane 72
By Joseph R. Aicher, Paul D. Birkhahn and H. C. Lester, Jr.
The company has developed a program which includes the effects of variables, inventories, and gasoline specifications on butane excesses and requirements, and alkylate production.

Shell Expands Sheridan Plant 80
By H. C. Bozeman
A two-phase program which raises capacity from 100 million to 150 million cubic feet daily has been completed at Shell's Sheridan, Tex., cycling plant.

Gulf's Port Arthur Ethylene Unit Revamped 82

How Algae Grow in Cooling-Tower Water 84
By Edward Tehle, Jr.
A 2-year study of water samples from recirculating cooling towers located throughout the U. S. shows how temperature, chromate, and other chemicals affect algae growth.

The Foreman's Page 90

Process Costimating—87 92

Continental Installs Cyclohexane Unit 98

Pipelining

Compressor Station Gets New Intake Filters 86

Savings From Cathodic Protection 93
By Frank A. Therrell, Jr.
The latest look at the cost of corrosion on bare pipelines clearly shows the payout of cathodic protection. And figures show that cathodic protection is indispensable with coated lines.

On-the-Job Pipelining 103
Truck tailored for corrosion repair—Hinged boards cut gasket storage space—Oil men using more electricity.

Drilling-Production

Will Corrosion Eat Up the Water-Flood Profit? 76
By L. C. Case
Hydrogen sulfide is probably the most important cause of corrosion in water-flood systems. Oxygen greatly accelerates H_2S attack.

Oil-Well Pumping—30 81
By Joseph Zaba

New Standards for 4½-in. API Casing 97
By John A. Casner
Safer, faster, and cheaper casing jobs should result. User can run mixed strings without excessive use of crossover joints.

the OIL AND GAS JOURNAL Newsletter

Tulsa, Okla.
Jan. 16, 1961

Good discoveries have given 1961 a fast send-off:

Four strikes make interesting reading.

In the Gulf of Mexico, Gulf Oil gets its best well yet around huge Block 135 salt dome off Louisiana.

In Utah, Champlin-Murphy may have opened new play for Paradox basin with big well south of Aneth.

In South Texas, Superior finds Deep Edwards oil in the middle of a 50-mile gap between existing trend production.

In Alberta, Shell brings in a big oil well in Waterton Park field, Canada's biggest reserve of natural gas (p. 52)*.

▼ ▼ ▼

Drilling activity in Alaska for 1961 should show a 25% increase over 1960, state sources predict. The oil industry rate of expenditure on exploration in the state should range from $40 to $50 million during the year.

Confidence in the future of the drilling industry is still being evidenced by at least one outfit. In recent weeks Brewster-Bartle has purchased a land rig in the New Mexico area, reconditioned and heavied it up for 16,000-ft. capacity. It also has acquired a submersible drilling barge. Both were acquired under favorable terms and have been put to work.

Drilling on tiny tracts may be outlawed in Texas this year. Legislature is almost sure to tackle issue during current session, and odds favor its passage.

Other Texas issues coming before lawmakers: More taxes on petroleum industry, compulsory field-wide unitization for secondary recovery, basic spacing law, tighter ratable-take law, pollution, and leasing on highway right of ways (p. 58).

▼ ▼ ▼

Shell has made an underwater completion attaching wellhead equipment on seabottom in 55 ft. of water.

The completion is a development well drilled to 8,300

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*Refers to article in this issue giving more details. When no page is given, the item is a Newsletter exclusive.

ft. about 35 miles offshore in Block 192, West Cameron area. Shell is keeping technique secret. Its work may provide key to drilling in deeper offshore waters of the world.

Shipments of oil-country goods for first 11 months of 1960 were 1,107,846 tons, 41% off same 1959 period and 59% off the big 1957 year.

Line-pipe shipments, on other hand, rose slightly to 2,549,581 tons, but this was 34% below 1957.

▼ ▼ ▼

Administration attitude on percentage depletion may jell in next few months. That's what Douglas Dillon tells Senate committee.

Dillon, the next Treasury secretary, says he has an open mind at this point on the issue. Subject was raised by Sen. John Williams, Delaware Republican and active advocate of a percentage cut.

Watch for oil-import signals at Interior to be called by the new assistant secretary for minerals rather than by the new under secretary, James Carr of California.

Currently, the under secretary is the top Interior official handling oil, but those who know Carr say he will want the assistant secretary to handle that assignment.

▼ ▼ ▼

Refiners east of the Rockies are asking: Why was my import quota cut by more than the 2.1% reduction in the crude imports allowed in Districts I-IV?

Answer: True, imports were cut some 14,600 bbl. daily under the last half of 1960. But about 13,400 bbl. daily more was allocated to 4 or 5 new importers and to about 30 companies who qualified for larger quotas because of technical adjustments or increased runs.

This meant a total of 28,000 bbl. daily had to be cut from quotas of other refiners. So 10 historic importers were cut 4.9% each for total of 19,000 bbl. daily. All the rest got cuts averaging 3.7%.

Those who decreased their runs last year got cut more than those who didn't, but the relationship of big and small refineries on the sliding scale was not changed.

Big refiners insist this sliding scale is unfair. With the value of an import quota estimated at $1 or more per barrel, a 10,000-bbl. refiner's quota is worth about one-fourth cent per gallon on all products. It works out to only about one-eighth cent per gallon for a refiner in the 150,000-plus bracket.

In District V, large refiners received higher percentage cutbacks than small, who have about a half-cent advantage.

Several new crude oil price bulletins have been released in the trade recently and crude buyers have them under study trying to spot any new trends.

Developments: Ashland cut 5 cents a barrel off price it pays for Illinois basin and Kentucky crudes to get back into line with what competition was paying. Mobil revised differential from 2 to 3 cents downward on Oklahoma crude below 36° gravity, also to conform to majority. Mobil, Texaco, Shell also have added new areas where they post. It could mean buyers are looking for more places to find crude, but a more likely explanation is that the companies are just trying to keep their postings up to date.

Tanker operators are enjoying a spurt of brisker business and stronger rates than a year ago.

Early January's cold has helped keep heating oil in heavy demand and boosted coastwise traffic. Result is that tanker rates have climbed to 30% above American Tanker Rate Schedule (p. 54).

Operators, however, don't expect good rates to return for any sustained period within the next 3 years.

▼ ▼ ▼

First strike in current round of wage negotiations has hit Phillips Petroleum at three chemical plants in Texas—Pasadena, Borger, and Dumas. More than 1,400 are idled.

Issues in the walkout by OCAW: Effective date of a 14-cent-per-hour pay increase, benefit-opener clause in work contract, company contributions to hospital insurance, and promotion policies of the company.

Here's how engineers view their work:

...One out of 4 believe engineers in industry are considered second class professionals. But no industrial managers agree with this opinion.

...61% of engineers in industry think there is considerable misuse of engineers. Only 30% of managers agree.

...More than half the engineers in industry think that higher pay would advance the engineering profession. Only 20% of industrial managers agree.

These findings were reported in a survey sponsored by the Professional Engineers Conference Board for Industry and the National Society of Professional Engineers.

Industry notes: Gas appliances in daily service in U. S. homes have climbed to all-time high of nearly 110 million, owned by 40 million residential customers...Army is testing a new oil storage method—pumping diesel oil into an unlined ice reservoir 100 ft. under the Greenland ice cap. Preliminary tests with avgas proved highly successful...Lion Oil will keep headquarters in El Dorado, Ark., instead of moving to St. Louis.

Market Memo

Jan. 16, 1961

Wage increases may become factor in holding prices up. At least they will make suppliers think twice before cutting.

Continental, in raising middle distillate prices in the Rocky Mountain region a half cent last week, attributed its action in part to added costs of the 5% wage increase.

Price move in Rockies follows similar increases by others on the East and Gulf coasts. Market conditions were ripe for the price movement—demand was running good. Test of higher price policy will come in March when the heating season is fading and the motoring season hasn't started.

Market picture generally is this: Distillates, especially No. 2, are firm at the higher prices on East and Gulf coasts and steady in other areas. Gasoline is seasonally soft except in California. Crude is firm and in tight supply.

On East Coast, other suppliers have met Esso's higher prices on distillates. There's still some discounting at Boston, Providence, Albany, and Baltimore; but colder weather will change this. Straw in wind: Five majors, wanting to buy No. 2 in New York harbor, find the material tight. They may have to go into the Gulf Coast to meet requirements.

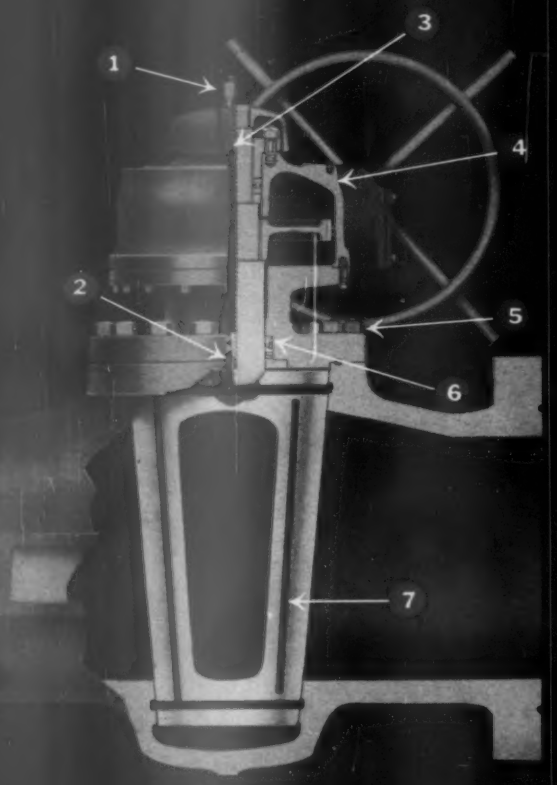
Gasoline market still has weak spots in parts of New York, New England, and North Carolina. But marketers can remember much worse situations at this time of year.

On the Gulf Coast, three cargoes of No. 2 moved last week at full posted price of 8.75 cents a gallon and several barge sales held at same price. More buying for shipment to the East could make No. 2 scarce. Majors with own tankers can ignore present one-quarter cent spread in laid-down cost of Gulf product in the East.

Several cargoes of gasoline are available on the Gulf, but there've been no sales to test a 11.25-cent posted price for 92-octane. Buyers talk of a realistic price of one-half to three-fourths cent off this if anyone is interested.

Other markets: Mississippi River sellers so far haven't taken offer to buy 287,000 bbl. of gasoline at three-fourths cent off Gulf Coast low. Distillates are firm in area... Group 3 also reports distillates strong with gasoline sagging a bit...Los Angeles basin's gasoline market is firming. No other major has followed 1-cent cut of Texaco and Shell last month in premium tankwagon posting. Rack prices also went up half cent last week, making new postings range from 11.3 cents a gallon for 90-octane to 13.8 cents for 100.

7 characteristics that make WALWORTH a better Lubricated Plug Valve



1. Valve can be lubricated with a Walworth High Pressure Lubricant Gun without removing lubricant fitting.

2. Double ball check valve prevents line pressure from getting into lubricant system.

3. Groove, cut part way up side of lubricating fitting, provides extra safety feature by allowing operator to note any tendency of lubricant to blow out before fitting is entirely removed.

4. For buried pipelines—gear housing design permits simple attachment of lubrication and handwheel extensions without modifying the gearcase.

5. Standard bolt threads, rather than fine threads, means easy replacement of nuts and bolts from local stocks.

6. Two overlapping Teflon* packing rings form an effective seal against possible leakage without "grabbing" the plug shank. Low break-out torque—plug turns easier.

7. Vertical and circumferential lubricant grooves completely frame the port openings, assuring a tight seal against leaks.

*Du Pont registered trade-mark

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No matter when you need it, you can count on a Walworth LPV to operate easily and dependably in handling gas, crude or finished products. In petroleum service throughout the world, these valves have long proved their complete dependability and easy maintenance. Walworth also designs and manufactures Gate, Globe, Angle and Check Valves for the oil and gas industries. For information, write Walworth Company, Lubricated Plug Valve Division, 3517 Polk Avenue, Houston 23, Texas.

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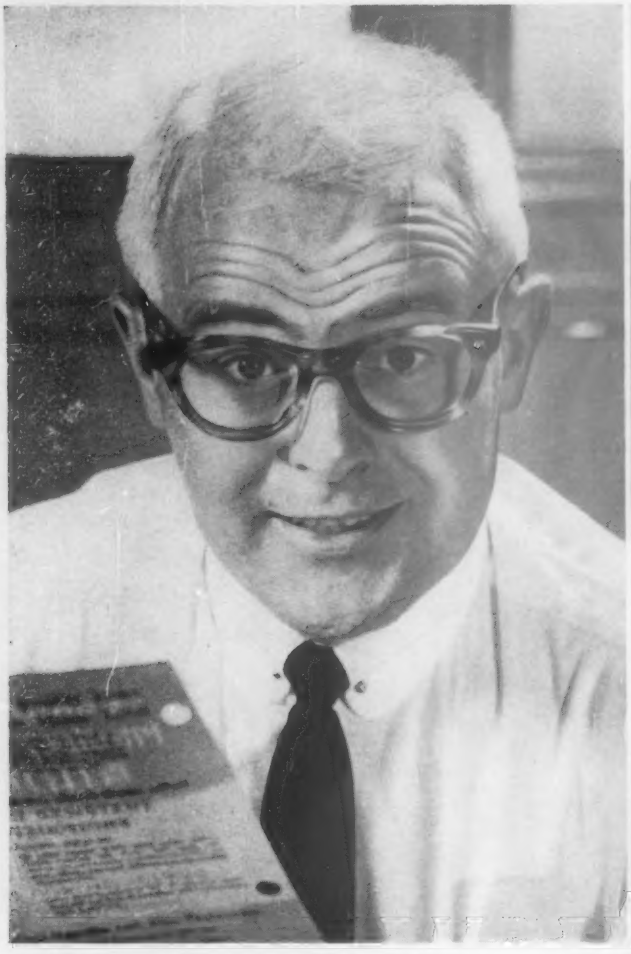
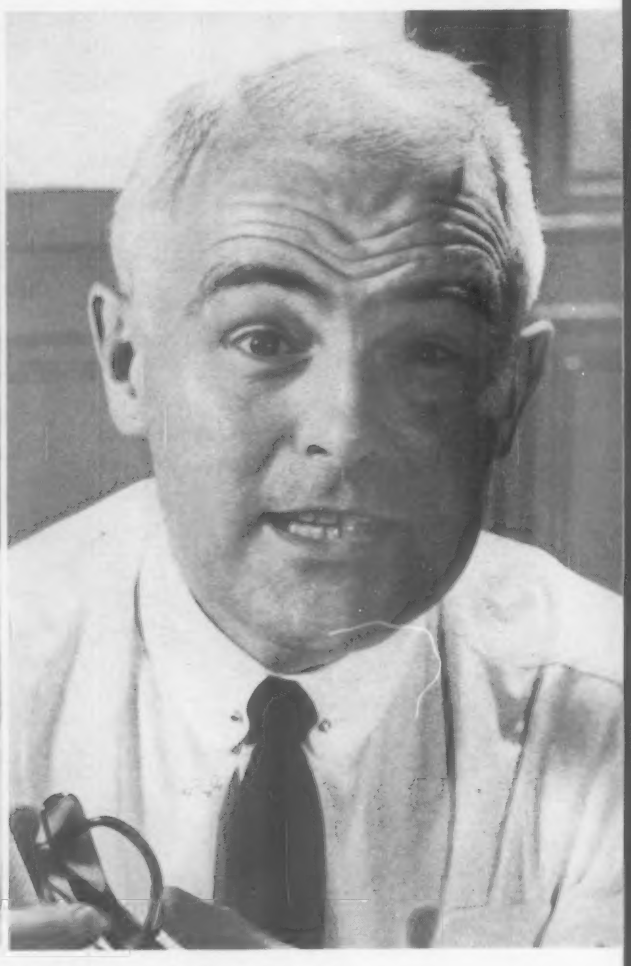
GOODYEAR

Hose? Goodyear



THE KIND I NEED?
(No matter how tough or unusual your application or what type hose it calls for—*Goodyear has the answer!)*



WHEN I NEED IT?
(When you need hose in a hurry—locally available right from distributor stocks—*Goodyear has the answer!)*

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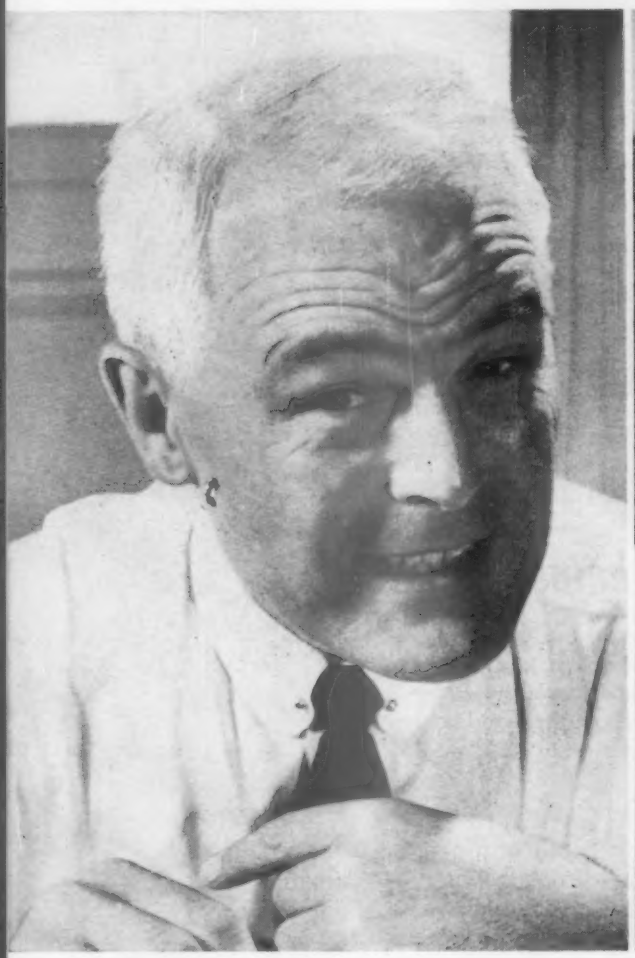
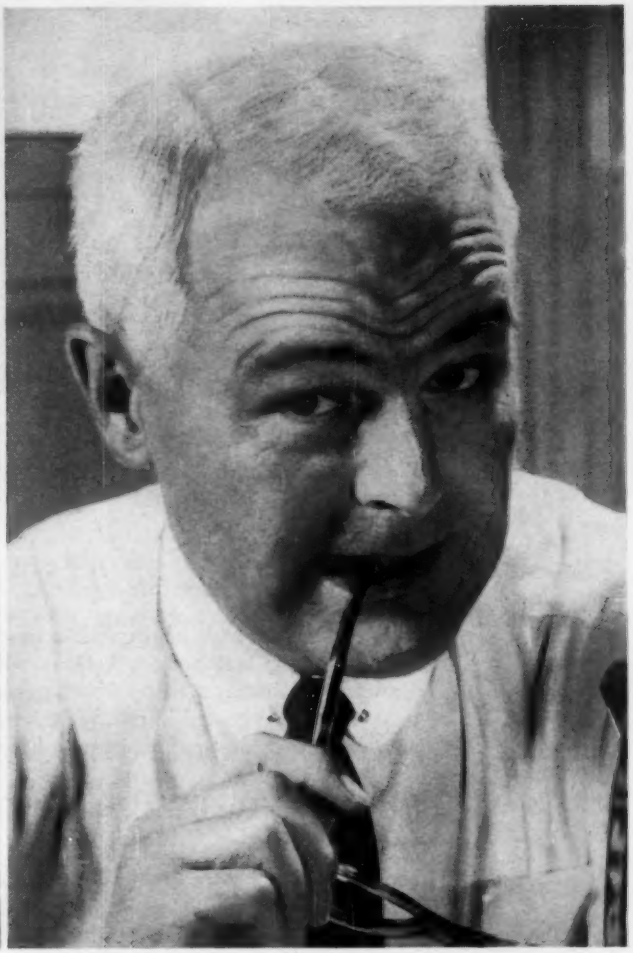
CALL YOUR GOODYEAR DISTRIBUTOR... first in

Lots of good things come from GOOD

Has All the Right Answers!





TOUGH AS I NEED IT?
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water puzzle

and how Halliburton helps you solve it!

Handling the problem of controlling unwanted water is a regular assignment for Halliburton. From the research laboratories in Duncan, Oklahoma . . . field laboratories in active oil areas . . . and vital experience gained in oilfields throughout the world . . . new answers to the water puzzle come to light. Here are a few . . .

IN AIR AND GAS DRILLING

HOWCO-SUDS is available in bulk, liquid or stick form to combat high or low volume water in air or gas drilled holes. It is a readily water soluble surfactant blend effective in both fresh or salt water, and is capable of foaming huge quantities of water from the well, even at elevated temperatures.

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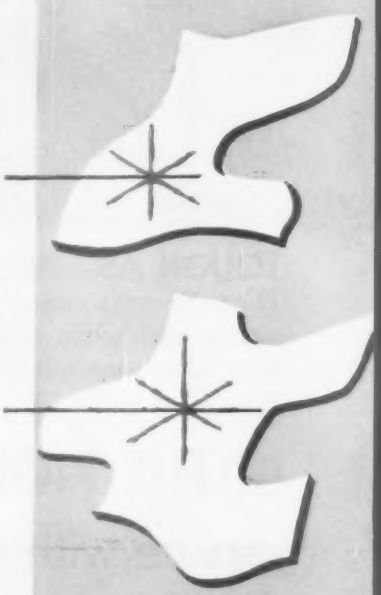
HALLIBURTON HYDRO-LOK MATERIALS are excellent water control agents in wells drilled with air, gas, and aerated muds.



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HALLIBURTON ISOPERM PROCESS is designed to help increase the efficiency of an established water flood project. Isoperm consists of controlled placement of chemicals into an injection well where they will move with the water to the zones of greatest permeability from which most of the oil has already been flooded. When the chemicals react in the formation, they form a gelatinous precipitate which greatly reduces the permeability of the formation within the reaction area. This causes the injection water to seek more receptive zones which may have been by-passed originally, and flood additional oil from the formation.

IN PRODUCING WELLS

HALLIBURTON HYDRO-LOK MATERIALS are available in three types. *Hydro-Lok (PWG)* is a proven grouting solution designed to help control water in producing and water injection wells. PWG has an initial viscosity almost the same as water. This aids in squeezing the PWG solution into the true permeability of the water producing formation. Once the solution begins to thicken, it rapidly forms a very stiff gel which helps plug the formation, but can be reversed easily from the well bore. *Hydro-Lok (PC-11)* is a plastic slurry formed with inert solid materials, and a resin mix which is squeezed into a formation to control water. *Hydro-Lok (HG-10)* the resin used in preparing PC-11, is employed where it is desired to obtain a deeper penetration than provided by PC-11 and a harder set than provided by PWG.

HALLIBURTON BLOX-ALL, a popular lost circulation material, is also useful in helping control formation water. Like PWG, Blox-All sets to form a stiff gel, but is only recommended for well temperatures below 140°.

if YOU have a water puzzle . . .

let your HALLIBURTON MAN help you solve it!

CHEMICAL SERVICES

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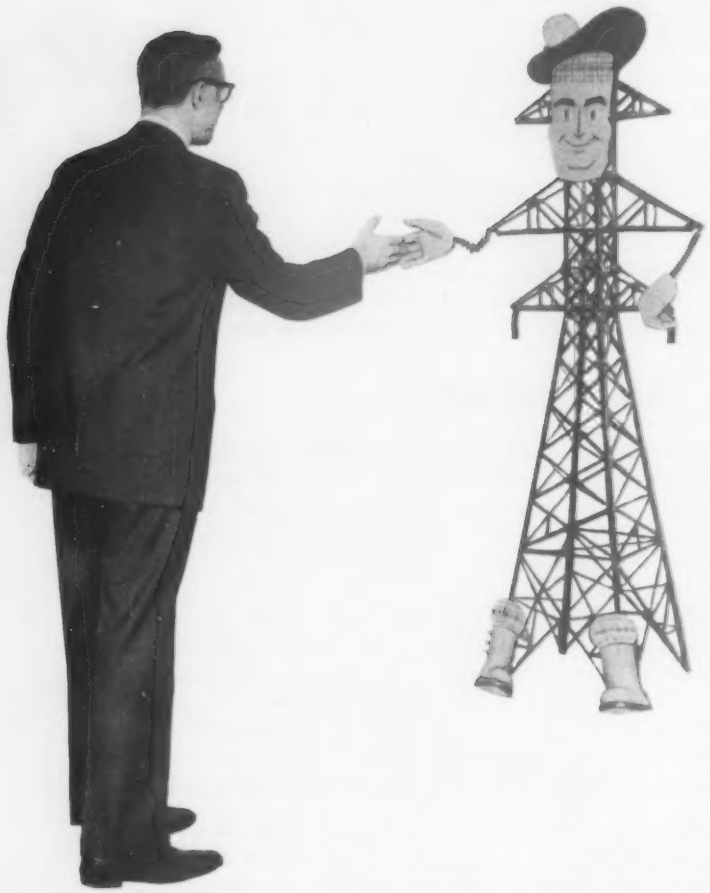
Memo to Management:

STOP WASTE...
with efficient power



The increasing availability of utility electric power has made it more and more useful in the current drive to stop waste of time, money, and manpower. The many economies of utility electric power have made it the ideal solution to problems in pumping, waterflooding, gathering, transmission as well as refining. For the latest facts on purchased electric power, consult your Utility Electric Power Company.

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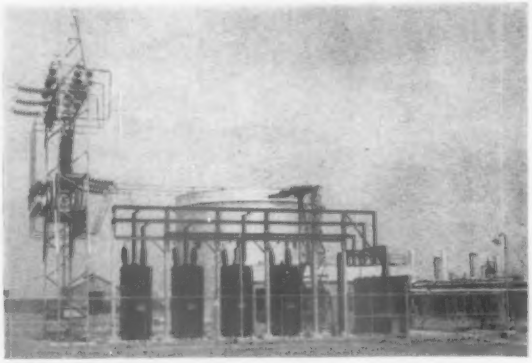
POWER ASSOCIATION

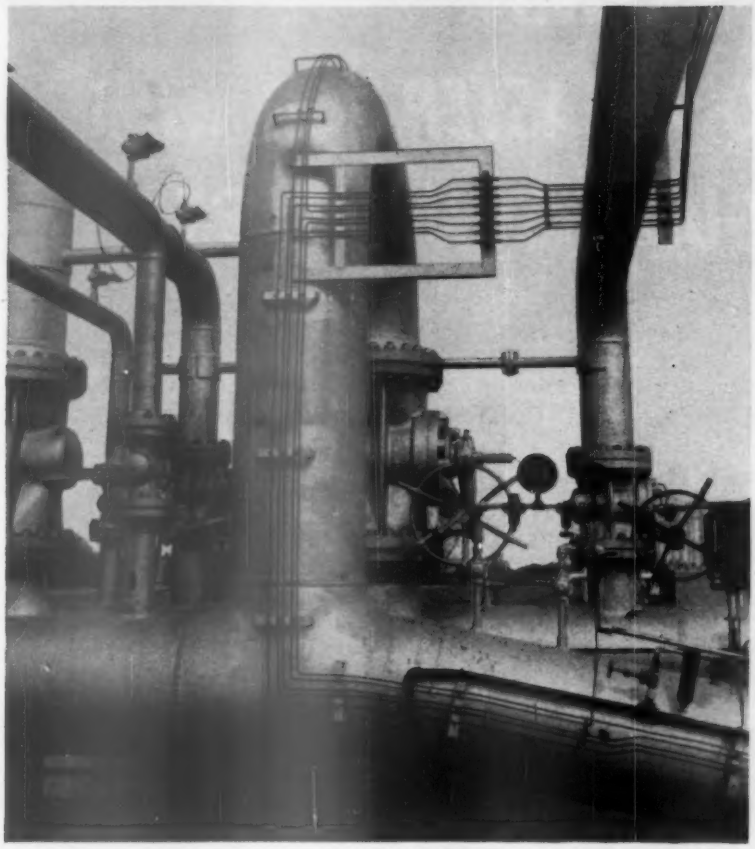
BOX 35006, DALLAS 35, TEXAS

A list of P.E.P.A. members will be furnished on request.



Another new development using

B.F.Goodrich Chemical *raw materials*



Extron "Tuff-Tube" corrosion-resistant, high-pressure tubing is manufactured of rigid Geon by Extron Corporation, Knoxville, Tennessee, and is used for process plant application like the one shown here. Sizes range from 1/4" thru 3/4" O.D. B.F.Goodrich Chemical Company supplies the Geon rigid vinyl.

Small process and instrument air lines of rigid Geon cut both the cost and corrosion

Corrosion — and cost — are frequent problems in the miles of small process, sample, purge and instrument air lines in chemical operations. One way to beat corrosion—and cut maintenance—is to buy lines of high-priced metals. Now there is a way to get tubing with necessary high pressure properties without going to expensive metals. This tubing is being made of rigid Geon vinyl.

Rigid Geon is ideal for this kind of operation. It resists most chemicals, hydrocarbons, oxidation or atmospheric conditions. At the same time it provides impact resistance and tensile strength far beyond this application's needs. Besides being reasonable in cost, rigid Geon tubing is easy to install, light in weight. It comes in different sizes and has color compounded in for installations where color-coding may be desirable.

Here's another example of how Geon improves a product, sometimes opening whole new markets or areas of application. For more information, write Department NL-1, B.F.Goodrich Chemical Company, 3135 Euclid Avenue, Cleveland 15, Ohio. Cable address: Goodchemco. In Canada: Kitchener, Ontario.

Geon VINYLS

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MY CREWS DO A FASTER JOB with GUIBERSON SWABS

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TYPE J .. lifts heaviest loads
TYPE L .. lifts medium or light loads
TYPE GW .. for light loads
TYPE K .. general purpose cup to 6,000 feet
SIMPLEX .. lifts fluid containing suspended sand

More than a third of a century of swab-making experience is behind each Guiberson swab and cup. No matter what type of production .. shallow or deep .. light or heavy loads .. smooth, rough or tight tubing .. you will pull more fluid with Guiberson swabs and cups. Regardless of your swabbing problem, you can meet it .. solve it .. quicker and cheaper with a Guiberson swab.

Cups are compounded to Guiberson's exclusive formulas for maximum resistance to oil .. acid .. abrasion.

SAFE THAN SORRY BETTER BE GUIBERSON

THE GUIBERSON CORPORATION

ESTABLISHED 1919
DALLAS, TEXAS
U. S. A.

Sold by Oil Field Supply Stores Everywhere

HOKE Flow Sheet 3

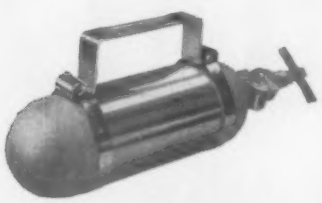
HOKE REPORTS ON FLUID CONTROL

WE'VE TOSSED A NEW BALL INTO AN OLD GAME

Do You Have A Bomb In Your Lab?

In the process industry, sampling cylinders are occasionally referred to as bombs. In recent months, this misnomer has been, unhappily, pretty close to the truth. Some military surplus, low carbon steel, two-piece cylinders have found their way into industry and have been used beyond their rather limited capabilities. Unfortunately, several serious accidents have spotlighted this use as a very real safety problem.

Since sampling is such a serious business, we have perfected, for maximum safety, a seamless, one-piece cylinder. This unabashed declaration of excellence has sound



basis in fact – the entire cylinder is formed from a single piece of seamless type 304 stainless steel tube. To quell the qualms of process men, sample contamination is practically nonexistent, and the cylinder resists destruction from most corrosives.

As a further safety guarantee, all standard sampling cylinders are fabricated to meet ICC and other safety regulations. Standard cylinders are available at pressures to 1800 psi (10 ml. to 1 gallon), but higher pressure cylinders can be had on special order.

If you'd like additional information on Hoke cylinders, plus a detailed paper on the various methods of collecting samples from process lines, drop us a line. We'll also include details on special cylinder valves, outage tubes and other cylinder accessories.

The technique of molding polyvinyl chloride into ball valve parts is old hat. Even the unplasticized compounds of type I PVC have been kicked around for a while (with minor successes). But until now, no one has booted the ball for a goal.

Perseverance, determination, and the pursuit of economic reward have prompted us to offer a line of ball valves molded of the toughest grade of type I, unplasticized PVC. There are no foreign agents to contribute to a corrosive demise, even in most caustic services. It even meets the proposed new ASTM specification and has a tensile strength of 8500 psi. Those who have had PVC piping problems will profit from the new molding process that gives these Hokes dimensional stability and very high impact strength. Sensitive systems, human and otherwise, are safe from contamination – they're absolutely non-toxic. We've set 140°F. as the operating temperature limit, but occasional excursions to 160°F. won't do any harm.

All standard models are supplied with a concentric hole drilled thru the ball. They can be heat welded, or solvent bonded right in the line. Piping hook-up is even simplified by their coupling-like assembly. Your assistant can fit each half of the valve to a pipe end, then reassemble the valve without having to turn the pipe. Pressures to 125 psi are duck soup for these valves.

A maintenance man's delight, they can be cleaned and have their seats changed without leaving the pipe. Their light weight makes them ideal for use on long, unsupported spans of pipe.

Size-wise, we're offering them in ½, ¾, 1, 1½, 2, and 3 inch sizes, all NPT female connections.

You will command the eternal admiration of your colleagues when you install these valves. Be the first to show your rightful status by ordering a shiny new Hoke polyvinyl chloride ball valve. If pride of ownership hasn't motivated you at this point, the mere fact that you are behind the scientific times should move you to find out more.

It isn't necessary to tell us why you want the additional information. Just check the coupon below. We'll forward the facts in a plain, brown envelope.

FREE! A STEADY FLOW OF FACTS!

Further flow features, and interesting technical topics are carefully covered in Hoke's technical publication, the FLOW SHEET. It's free, but worth millions! To get the full benefit of our engineering and editorial efforts six times a year, mark your "X" in the proper box.

Hoke's Performance Guarantee — *Every Valve Leak-Tested!*

HOKE, INCORPORATED
63 Piermont Road, Cresskill, N. J.

Send me complete information on the Hoke products checked below:

- ☐ PVC Ball Valves
- ☐ Sampling Cylinders
- ☐ Flow Sheet
- ☐ FREE Corrosion Slide Rule
- ☐ Complete Catalog GC959

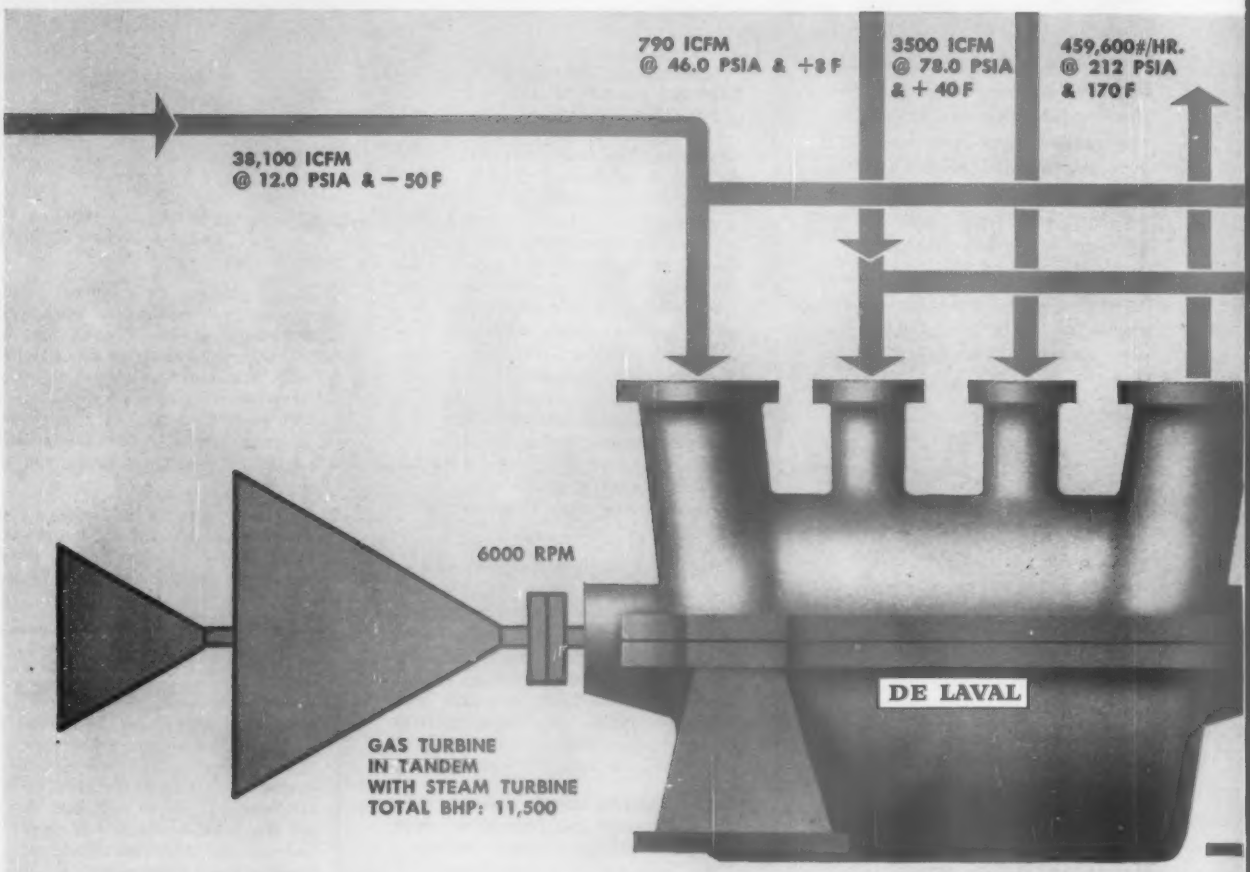
NAME _____ TITLE _____

COMPANY _____

ADDRESS _____

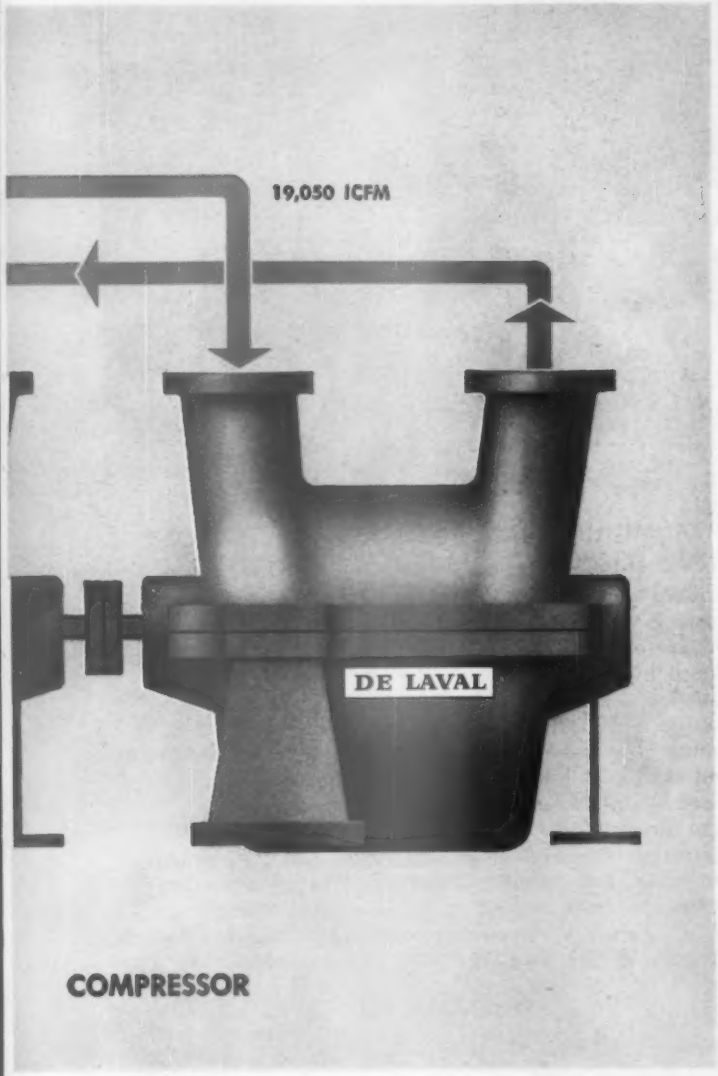
CITY _____ STATE _____

Unique arrangement of compressors demonstrates



NATURAL GASOLINE PLANT—PROPANE REFRIGERATION

centrifugal
DE LAVAL design flexibility



Here is a good example of De Laval design flexibility. In this centrifugal compressor installation the customer wanted to use gas turbine drive because it would provide the most economical use of process fuel. But no single flow compressor design could operate at gas turbine speeds. De Laval creative engineering solved this problem by splitting the flow into two units and several stages as illustrated on these pages.

You can count on De Laval for flexible approaches to engineering problems. We have built high capacity and special purpose centrifugal compressors to meet the special requirements of the petroleum, petrochemical and chemical industries. Why not benefit by our more than 40 years of experience in solving gas compression problems?

Send for De Laval Bulletin 0504.

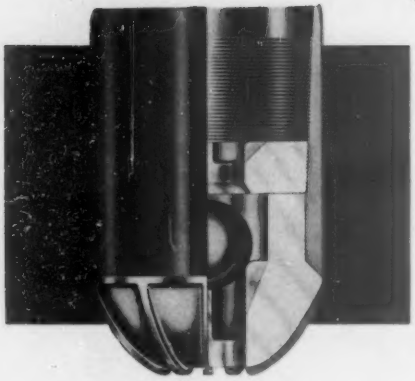
DE LAVAL **STEAM TURBINE COMPANY**

610 NOTTINGHAM WAY, TRENTON 2, N. J.

OL-231

"for a sure thing in cementing

PUT YOUR MONEY ON THE NOSE"



RECTOR TYPE "A" FLOAT SHOE

Precision machined from seamless steel tubing. Internal parts are high-strength, drillable aluminum alloy. Moulded rubber-covered float ball insures positive seating.

DRILLABLE ALUMINUM NOSE MAKES RECTOR TYPE "A" CEMENTING EQUIPMENT A WINNER EVERY TIME

The ribbed aluminum guide nose on RECTOR'S Type "A" float shoe is your best bet for getting pipe safely "on bottom" every time. Made from a special aluminum alloy, developed by RECTOR, it provides far greater impact, compression, tensile and shear strength than either concrete or bakelite. RECTOR'S aluminum guide nose guides the cementing shoe past ledges, bridges and other obstructions without danger of breaking. On completion, the aluminum alloy can be drilled out easily, and because there is less material to drill out, it drills out faster.

This superior feature is yours at no extra cost . . . So, for dependability, and exacting performance in all cementing operations, put your money on a sure winner. Specify RECTOR Type "A" cementing equipment from your favorite supply store or see your RECTOR representative.

30 YEARS MAKING THE OIL INDUSTRY SAFER

Rector

Well Equipment Co., Inc.

Making the Oil Industry Safer!

PESA

MONOGRAMMED EQUIPMENT CERTIFICATE NO. 2158

1100 North Commerce, Fort Worth, Texas Houston Plant: 2215 Commerce Street

EXPORT REPRESENTATIVES: Continental-Emsco Co., Mid-Continent Supply Co., Oilwell Division of United States Steel Corporation

Over 50 compressor sales with 12 repeat orders the first 18 months

THERE IS NO FINER TESTIMONIAL THAN REPEAT SALES TO SATISFIED CUSTOMERS

Ajax has been selling its new compressors for a little more than 18 months. 12 of these large unit buyers have re-ordered additional units. The craftmanship, quality, and integrity of the Ajax name carries through the entire line of pumps, compressors, and engines. Let us work with you to determine the right unit to do the best job.

AJAX IRON WORKS CORRY, PENNSYLVANIA

Oil Field Distributors

- The National Supply Co. — Pittsburgh, Pennsylvania
- Bethlehem Steel Co. — Supply Division, Tulsa, Oklahoma
- Mid-Continent Supply Co. — Fort Worth, Texas

Selecting A Motor Drive For A Hazardous Area?

Here's how

TEIGF motors

by E-M

provide safe, dependable, economical power

Faced with the problem of driving hydrogen compressors in atmospheres which might contain hydrocarbons at their Baltimore refinery, engineers of Esso Standard Oil Company turned to TEIGF (Totally Enclosed Inert Gas Filled) Motors. Horsepower requirements exceeded the practicable limits under which explosion-proof motors could be used.

An important consideration was getting the greatest possible drive economy while operating safely in a possible hydrogen atmosphere. Three E-M 350 hp, 390 rpm TEIGF Motors are on duty at Esso Standard Oil Company fulfilling these important qualifications.

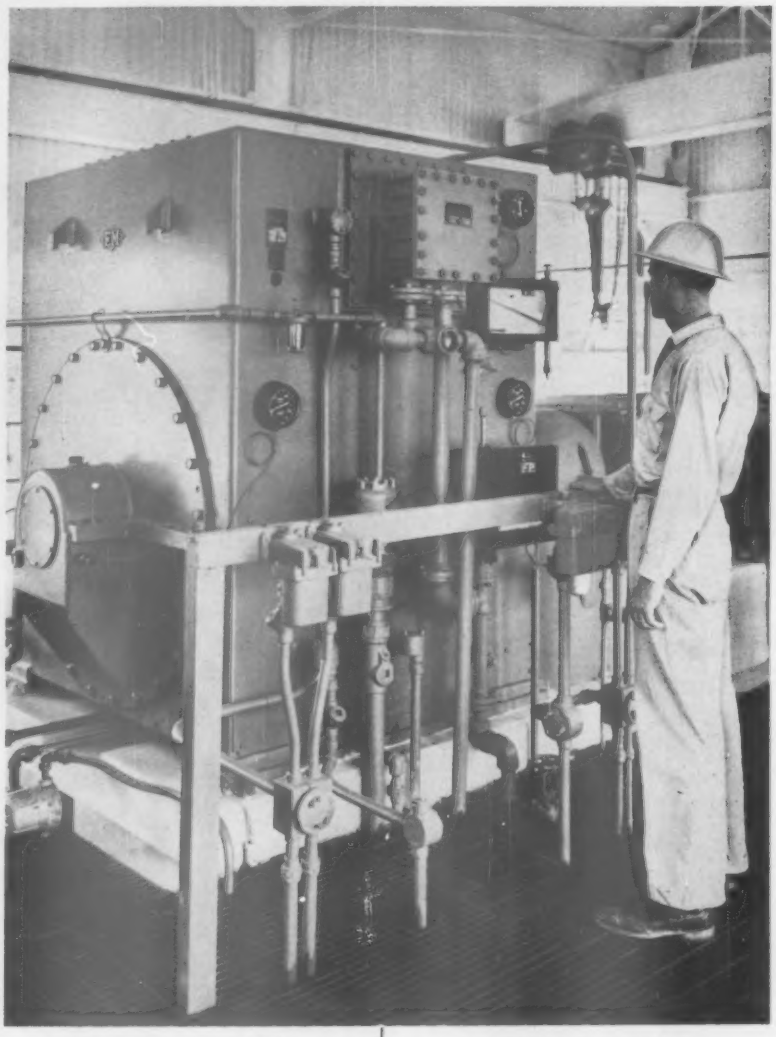
For Esso Standard Oil Company and other companies with similar problems, these E-M Motors offer three main groups of advantages:

1. SAFETY — Within the motor enclosure, inert gas pressure above atmospheric keeps explosive hydrogen *out*. A series of features help accomplish complete safety . . . inert gas pressure gauges . . . temperature gauges . . . purging valves, etc. and a full line of optional equipment. The E-M TEIGF Motor can be "customized" to meet your needs exactly.

2. RUGGED DEPENDABILITY. E-M uses specially designed "box type" frames of heavy-duty plate steel reinforced with heavy bar-stock ribs. They cannot twist or distort. Air gap is accurate and permanent, as all frame welding is completed before precision boring. Ventilating gas passages are carefully engineered to provide unimpeded gas flow for optimum cooling.

3. ECONOMICAL OPERATION. In E-M TEIGF Motors, gas loss is lower than commercially accepted standards. Specially designed shaft seals are oil-pressure gas-sealed bearing type, virtually non-wearing. Where bolts enter outside casing, E-M engineers specify blind holes . . . tapping and drilling are done *into* casing, not through. Operating and maintenance costs are at a minimum.

Consult your nearest E-M sales engineer, or write the factory for TEIGF Motor Bulletin No. 226.



TYPICAL STANDARD FEATURES INCLUDE:

1. Top-mounted gas-to-water cooler for use with suitable cooling water supply.
2. Forced-feed lubricated bearings and oil-pressure gas seals.
3. Oil pump, motor and oil filter. (Can be supplied optionally inside enclosure.)
4. Inert-gas temperature gauge.
5. Inert-gas pressure gauge.

(additional features shown in Bulletin No. 226)

TYPICAL OPTIONAL FEATURES INCLUDE:

1. Water cooler with double-tube construction for added protection against leakage.
2. Liquid level detector switch. Accumulation of moisture within motor sounds alarm or shuts down motor.
3. Bearing temperature relays, to sound alarm or shut down motor.
4. Explosion-proof motor terminal pothead or inert-gas filled terminal box.
5. Water flow indicator. Can be adapted for use with pneumatic-type regulating device.

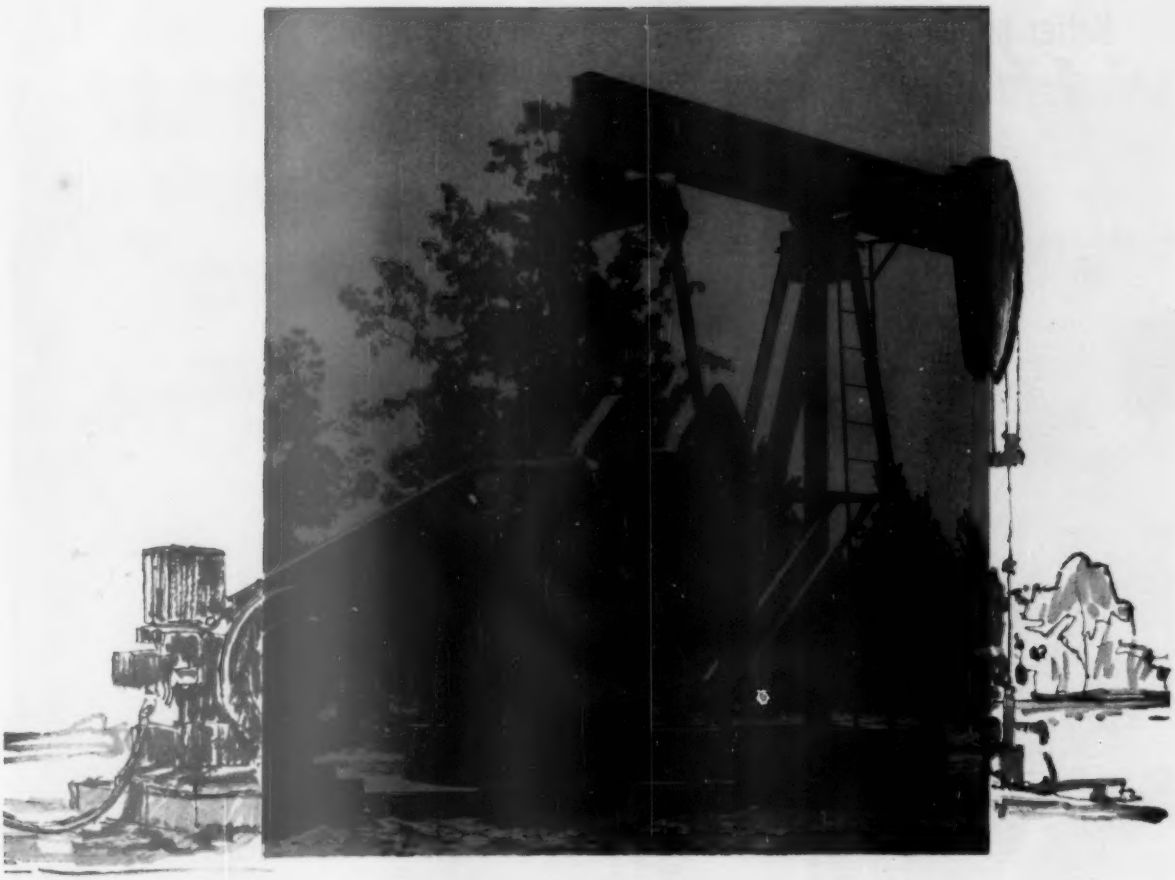
ELECTRIC MACHINERY MFG. COMPANY

MINNEAPOLIS 13, MINNESOTA

Specialists in making motors do

EXACTLY WHAT YOU WANT THEM TO

1300—TPA—2179



See anything unusual here?

Well—look closely! It's an "Oilwell" Century Pumping Unit, a Witte Gas-Gasoline Engine, a quality Polished Rod (as well as a bottom hole pump and sucker rods that you can't see). And what's more—it was all obtained from the nearby "Oilwell" store.

So, stop looking for something unusual in this familiar scene.

This is typical of the many 100% "Oilwell"-equipped wells where expertly engineered and precision built machinery is providing reliable service with a minimum of attention and expense.

Your "Oilwell" store has all this and more too—a capable and courteous crew willing to assist you in the selection of the proper equipment for any of your production needs.

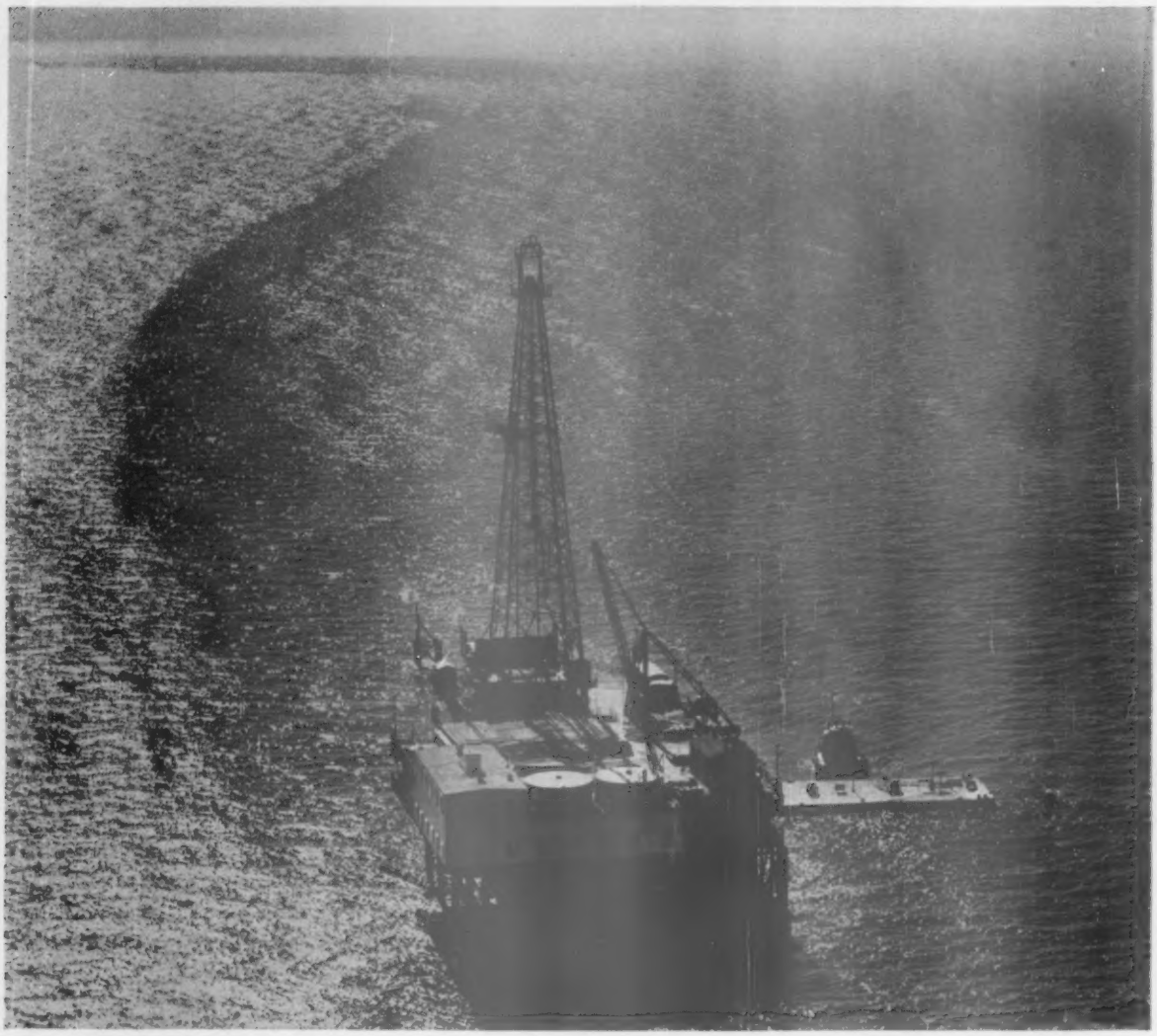
USS and "Oilwell" are registered trademarks

This mark tells you a product is made of modern, dependable Steel.

Oil Well Supply Division of United States Steel

Executive Offices: Dallas, Texas
Export Offices: 30 Rockefeller Plaza, New York 20, N. Y.

Better products, *faster*, from your Federal-Mogul jobber:



Here's where Federal-Mogul Bearings really shine!

Miles out in the Gulf of Mexico, or along the bayous, Fm engine bearings are worth their weight in gold. On any rig wherever daily footage of hole counts, engine bearings must be able to take punishment. That is why leading engine builders and experienced maintenance mechanics demand Federal-Mogul—the finest engine bearings money can buy.

But even more important than their precision engineering for specific engine applications is the ready availability of this line around the world. Strategic locations of nearby jobber stocks for rapid replacement is an unequaled "plus" appreciated by drillers everywhere. Your Federal-Mogul jobber is the man to call when overhauls call for bearings.

FEDERAL-MOGUL ENGINE BEARINGS

FEDERAL-MOGUL SERVICE

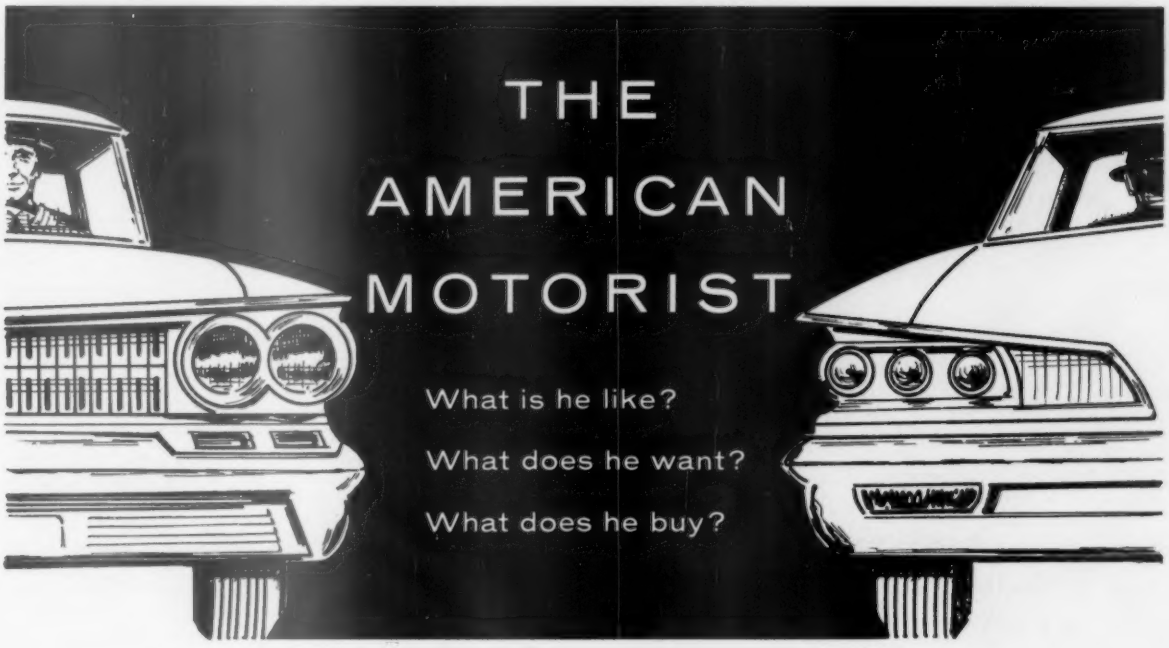
DIVISION OF FEDERAL-MOGUL-BOWER BEARINGS, INC. • DETROIT 13, MICHIGAN

BEARING FEDERAL Mogul SERVICE

DU PONT *Petroleum Chemicals* NEWS

Number 106 in a series of bulletins for the Petroleum Industry

JANUARY • FEBRUARY 1961



New Du Pont study of 4,507 motorists reveals latest trends in buying habits

Are motorists becoming more loyal to their local service stations . . . or less?

How much influence do give-aways have in the motorist's choice of gasolines?

What percentage of people use their cars on vacations? How popular are credit cards? How do they influence buying habits?

These are just a handful of the questions answered by Du Pont's newest survey, "Profile of the Motorist"— the fourth in a series that constitutes the most complete study ever made of the American motoring public.

From coast to coast, 4,507 motorists were interviewed in this survey. Each interview was a penetrating study of the person's likes and dislikes, and his or her buying habits. Some 61 questions were asked, ranging from "Did you buy at a station with lower prices during a price war?" and "Do you still usually buy your gasoline at this station?" to "Do you have access to a private swimming pool?" and "Where did you spend your last vacation?"

The result of this interviewing is a vast array of data which has been fed into a processing system from which various combinations of facts can be extracted to answer specific questions for oil marketers.

Your questions answered

The "Profile of the Motorist" survey is part four of Du Pont's continuing investigations (begun in 1952) into the patterns of motorists' buying habits. These studies are offered to the industry as a service from Du Pont.

For further information, contact your Du Pont Petroleum Chemicals representative.

Man with the facts

at Du Pont is Roberts W. Brokaw, survey analyst in the Special Services Section, who is in charge of assembling data from the "Profile of the Motorist" study to answer specific questions for Du Pont customers. Mr. Brokaw has been with the Petroleum Chemicals Division since its formation in 1947 and has supervised all previous motorist studies.

ADVERTISEMENT—Prepared for the Petroleum Chemicals Division of E. I. du Pont de Nemours & Company (Inc.)

OVER

DUPONT *Petroleum Chemicals* NEWS

The show about the road is now on the road

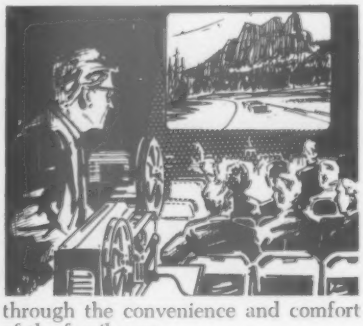
Every road in America leads to adventure.

This, in seven words, is the theme behind one of the oil industry's newest travel development tools – Du Pont's new half-hour color movie, "Highway Holiday."

"Highway Holiday" is a 16mm version of the CinemaScope feature "Down the Road," which is now being distributed to theaters across the nation by 20th Century-Fox. "Holiday" is designed for non-paying showings to any interested group. Both films are part of Du Pont's marketing services to the oil industry.

"Highway Holiday" takes the audience to all corners of the American continent – from the sweeping highway across the Painted Desert to a historic old village in New England, from the gleaming sands of Daytona to the majestic mountains of Canada, from Quebec to Mexico.

All this travel has a meaning. "Highway Holiday" will encourage a greater appreciation of the heritage and beauties of America, and stimulate motorists' interest in seeing them firsthand



through the convenience and comfort of the family car.

Prints available

You can obtain prints of "Highway Holiday" for showing to clubs and other groups, or for local television use. The film is intended to provide you, as a marketer of gasoline and other oil products, with a *broad* "expand-the-demand" promotion, as a backdrop for your own travel development activities.

For further information, contact your Du Pont Petroleum Chemicals representative.

Low-cost way to break foam in gas scrubbing

Here is a new wrinkle that is already helping several companies to cut the cost of foam breaking in atmospheric and vacuum distillation processes.

The foam-killer that makes this possible is Du Pont's OCENOL,® which is already well known for its anti-foam advantages in amine processes for removing H_2S and CO_2 from liquid hydrocarbons, natural and refinery gases.

OCENOL carries a low price tag, and works effectively in small concentrations of only 0.1 to 0.3 lb. per 1,000 barrels. The result is that you pay a very low price to break foam with OCENOL.

Facts in data sheet

OCENOL is a technical grade of oleyl alcohol, rich in cetyl and unsaturated C_{16} alcohols. It is available in two forms: OCENOL and OCENOL P. OCENOL P contains a lower proportion of unsaturates than OCENOL. In some applications, the products can be used interchangeably.

For information, contact your Du Pont Petroleum Chemicals representative.

ASSISTANT GENERAL MANAGER

CARL S. OLDACH is Assistant General Manager of Du Pont's Organic Chemicals Department, one of the divisions of which is Petroleum Chemicals.

Mr. Oldach joined the company in 1940, as a senior chemical engineer in the Ammonia Department (now the Polychemicals Department) laboratories at the Experimental Station in Wilmington. In succeeding years he held several technical management positions in the department, and in 1955 he became Assistant Director of the Development Department. In 1958 he was transferred to the Organic Chemicals Department as Director of Sales of the Freon® Products Division. In May 1960, he was appointed to his present post as Assistant General Manager of the department.

Mr. Oldach has a Doctor of Science degree in chemical engineering from the Massachusetts Institute of Technology, in addition to his Bachelor of Science degree from Yale University.

He has published a number of scientific articles relating to analysis of sulfur compounds in gases. He is a member of the General Committee of the Refining Division of the API, and also holds memberships in the American Institute of Chemical Engineers and the American Chemical Society.

Born November 28, 1914 in San Diego, Calif., Mr. Oldach now lives in Wilmington, Del. with his wife, two daughters and son.

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New York 20–45 Rockefeller Plaza . . . . . COlumbus 5-2342
Philadelphia 2–3 Penn Center Plaza . LOcust 8-3531
Pittsburgh 22–1 Gateway Center . . . ATlantic 1-2933
San Francisco 4–111 Sutter St. . . . . EXbrook 2-1934
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. . . through Chemistry

Du Pont Lead Antiknock Compounds and other Petroleum Additives

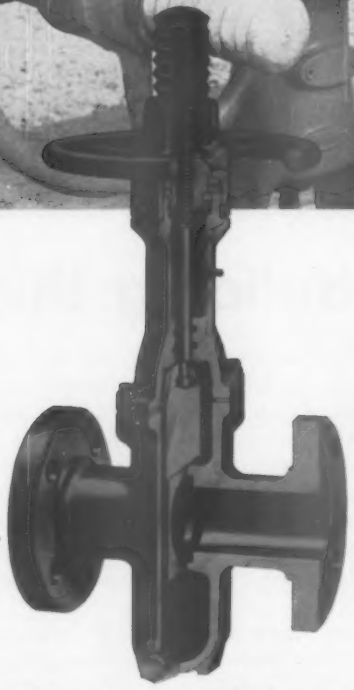
OVER

ADVERTISEMENT—Prepared for the Petroleum Chemicals Division of E. I. du Pont de Nemours & Company (Inc.)

A-18273

Printed in U.S.A.

4" W-K-M Pressure Sealing Gate Valves serve as emergency shut-off for regulator handling hot P.B.C. at 440 psi, in natural gasoline plant.



Floating Seats Make Sealing Easy

Seats are specially formulated elastomer molded to a hardened steel insert. When the gate closes, line pressure forces the gate against the downstream seat making a tight seal. The upstream seat floats against the gate to maintain an upstream seal.

Emergency shut-off is a cinch with W-K-M's Pressure Sealing Gate Valve

A unique W-K-M seat design makes line pressure do most of the work — sealing the seats to positive shut-off, upstream and down. But easy operation is only part of the story.

W-K-M's new Pressure Sealing Gate Valve is ruggedly dependable. It automatically compensates for seat wear, automatically relieves excessive body pressure. And on-the-line overhaul is a simple matter.

Wherever you need a smooth-operating valve for pressures to 720 psi and temperatures to 250° F., specify W-K-M's new Pressure Sealing Gate Valve. Sizes 2" through 30" — at leading distributors.

WRITE FOR CATALOG 1200

W-K-M

DIVISION OF ACF INDUSTRIES
INCORPORATED
P. O. BOX 2117, HOUSTON, TEXAS

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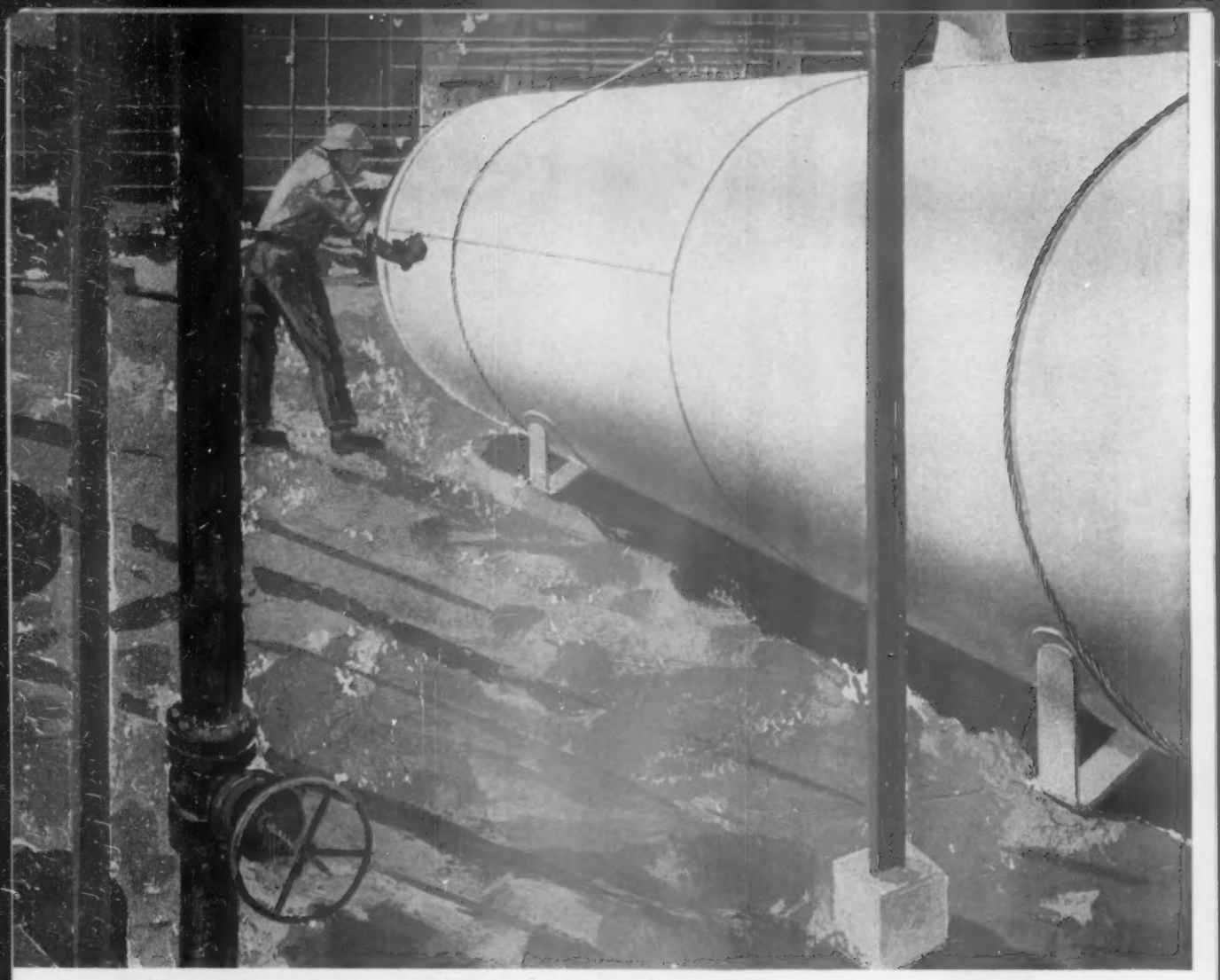


$3,267 could be saved by building this

Here is a design for an LP gas storage tank that hasn't been built yet. It is 20 feet long and 72 inches inside diameter.

The tank was designed by the Consolidated Western Division of United States Steel. Costs were estimated for the tank using structural carbon steel (A-285) and two other ways using USS "T-1" Constructional Alloy Steel, code and non-code, as indicated in the tables.

The design stress for one of the USS "T-1" Steel tanks is 50,000 psi. This is considerably higher than is permitted by the ASME code Case 1204-4.

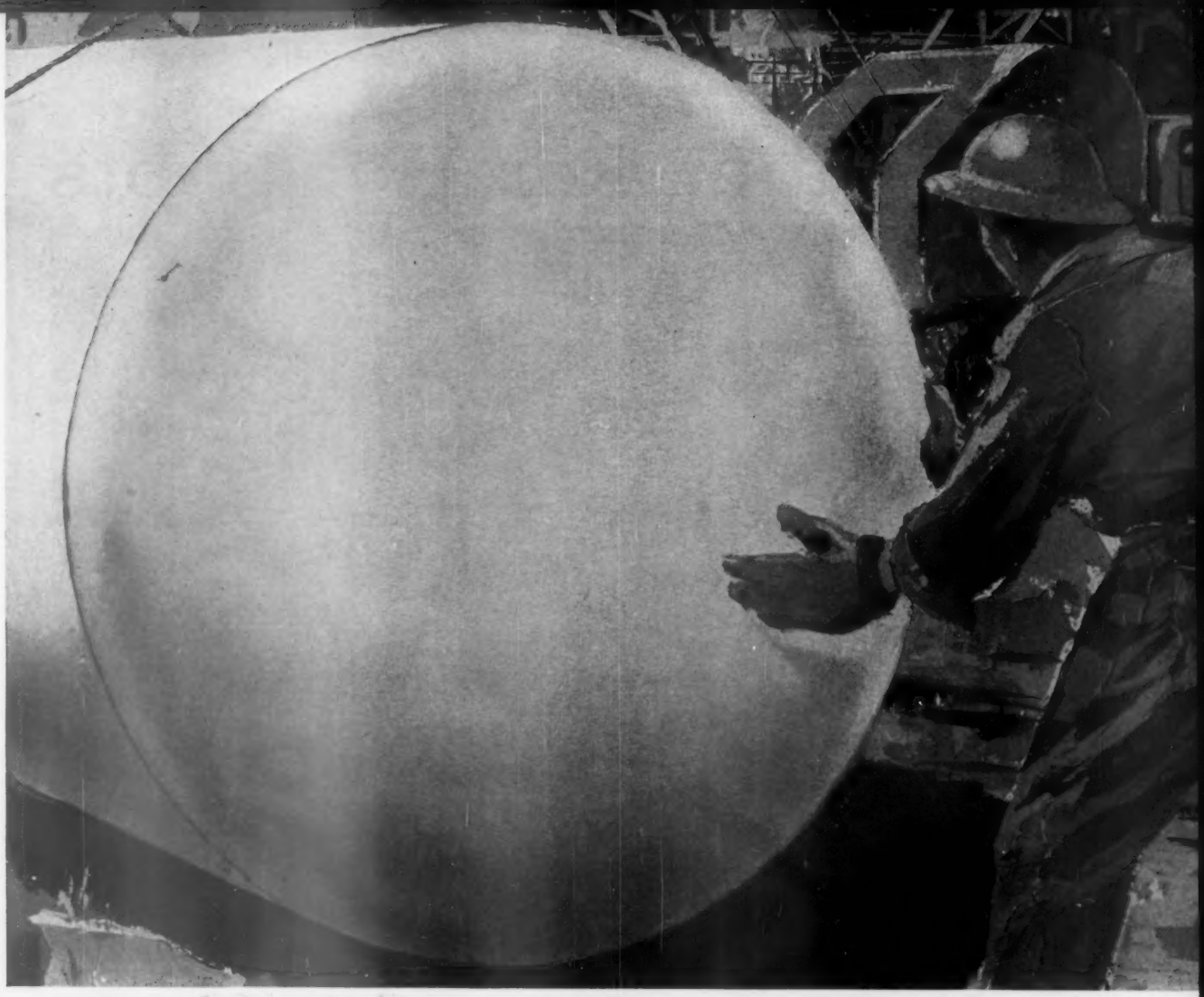
USS "T-1" Steel Construction costs less. As you can see from the tabulation, the maximum saving in total costs with USS "T-1" Steel (non-code) is $3,267 (Column 3) compared with carbon steel and amounts to $1,065 when the "T-1" Steel "code" vessel (Column 2) is compared with A-285 Grade C. The difference between the "T-1" Steel "code" and "non-code" vessel costs is a substantial $2202.

The big savings come from the fact that plate thickness can be reduced substantially because of the great strength of USS "T-1" Steel (100,000 minimum yield strength). This makes the cost of the steel lower, in the one case, in addition to reducing the fabrication and freight costs. For the price of 5 carbon steel tanks, 6 "T-1" Steel tanks conforming to ASME 1204-4, or 9 tanks designed to 50,000 psi stress (Column 3) could be built!

Lower maintenance, too! USS "T-1" Steel has four times the resistance to atmospheric corrosion as structural carbon steel. Research has shown that paint lasts longer on steels of this nature—and intervals between paintings are much greater.

Retains toughness down to −50°F. Even at low temperatures, USS "T-1" Steel retains its strength and toughness. It also has high resistance to impact abrasion and is weldable by the usual methods. These plus values make USS "T-1" Steel ideal for other equipment besides tanks—machinery hauling trailers, truck tanks, offshore rigs and other equipment that must be built stronger and lighter. Write for a copy of our booklet, "Designing and Fabricating Structures of USS 'T-1' Steel," United States Steel, 525 William Penn Place, Pittsburgh 30, Pennsylvania.

USS and "T-1" are registered trademarks



LP gas storage tank from USS "T-1" Steel

Cost Advantages of USS "T-1" Steel

Material Code Allowable Stress Joint Efficiency	#1 A-285 Gr.C Firebox 1958 ASME Code 13,750 PSI 100% X-ray Stress Relief	#2 "T-1" Firebox ASME 1204.4 28,750 PSI 100% X-ray Stress Relief	#3 "T-1" Firebox Non-Code 50,000 PSI 100% X-ray No Stress Relief
1. Thickness of shell plates	$1\frac{11}{16}$" Nominal	$\frac{25}{32}$" Nominal	$\frac{7}{16}$" Nominal
2. Thickness of shell heads	$1\frac{11}{16}$" Nominal	$\frac{13}{16}$" Nominal	$\frac{1}{2}$" Nominal
Weight	7310#	3484#	2158#
3. Weight of steel required (excl. heads)	26586#	12150#	6767#
4. Type of electrodes used for welding	AWS-E-7018	AWS-E-11018-G	AWS-E-11018-G
	491#	96#	48#
5. Cost			
a. steel cost	$3,394	$3,541	$2,207
b. fabrication cost—pressure vessel	2,670	1,650	1,014
c. freight—inbound—(delivered steel)	992	469	273
d. erection cost	None	None	None
e. 6" ϕ nozzle-installed	270	601	565
6. Total Cost	$7,326	$6,261	$4,059
F.O.B. Shops—Los Angeles, Calif.			
Over-all Savings with USS "T-1" Steel	.....	$1,065	$3,267

This mark tells you a product is made of modern, dependable Steel.

United States Steel Corporation—Pittsburgh
Columbia-Geneva Steel—San Francisco
National Tube—Pittsburgh
Tennessee Coal & Iron—Fairfield, Alabama
United States Steel Supply—Steel Service Centers
United States Steel Export Company

United States Steel

SILICONE NEWS from Dow Corning

New Paint For Hot Spots

Silicone-based paints stay put ...resist corrosion, weathering

Guarding metal surfaces from weathering and chemical attack is tough enough. Keeping them protected when surface temperatures climb to 700 F, 800 F — even 1000 F — is tougher still. Most paints fail rapidly, blister and peel. But paints based on Dow Corning Silicones retain their protective properties, even on the hottest jobs.

Whether the surface stays hot, or shuttles between hot and cold, makes no difference to a silicone paint. Here's a new kind of protective coating . . . one that you can depend on to provide real protection, withstand oxidation, corrosive atmospheres or weathering. When paint lasts like this — from 25% to 100% longer — you save money because (1) less paint is required; (2) costly downtime and labor are greatly reduced.

Another plus: Silicone-based paints are available in a wide range of colors. This means you can carry color-coding over onto hot equipment without worrying about early paint failure. To new product designers, this feature means finishes that resist chalking, checking, fading — retain their original beauty and protection.

For protecting a "hot spot" or a "hot product", it'll pay you to use paints made with Dow Corning silicone resins. Write today for more information.

"After 5 years, silicone paint still protects bronze-melting furnace. Organic paints failed within days after application."
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"After two years, mufflers coated with silicone paint are still in good shape. Organic paint used on similar 500 F mufflers burned away long ago."
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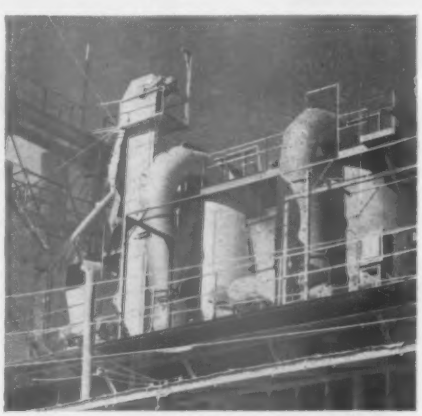

"By far the most satisfactory paint we have ever used on kilns and stacks with surface temperatures of 650 to 750 F."
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Send for illustrated brochure, "Why Silicone-Based Paints Mean Less Maintenance", plus list of suppliers. Address Dept. 6213.

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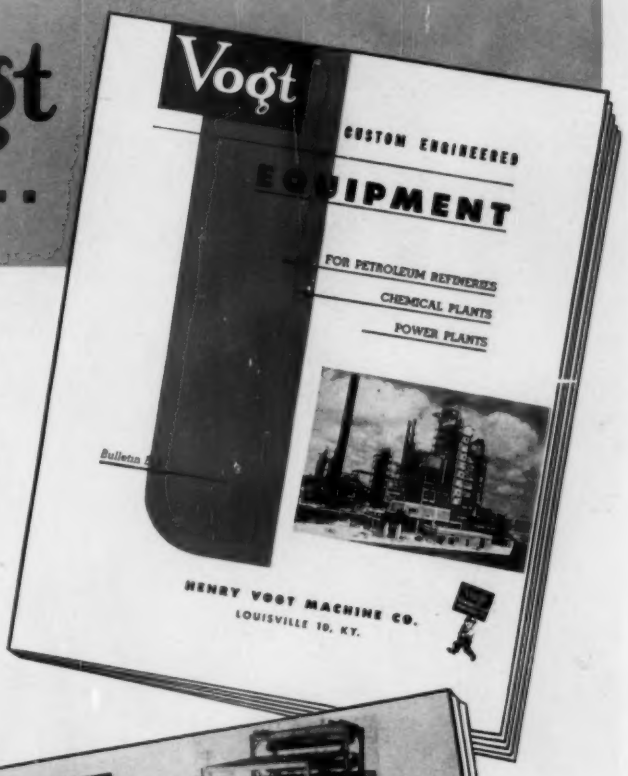

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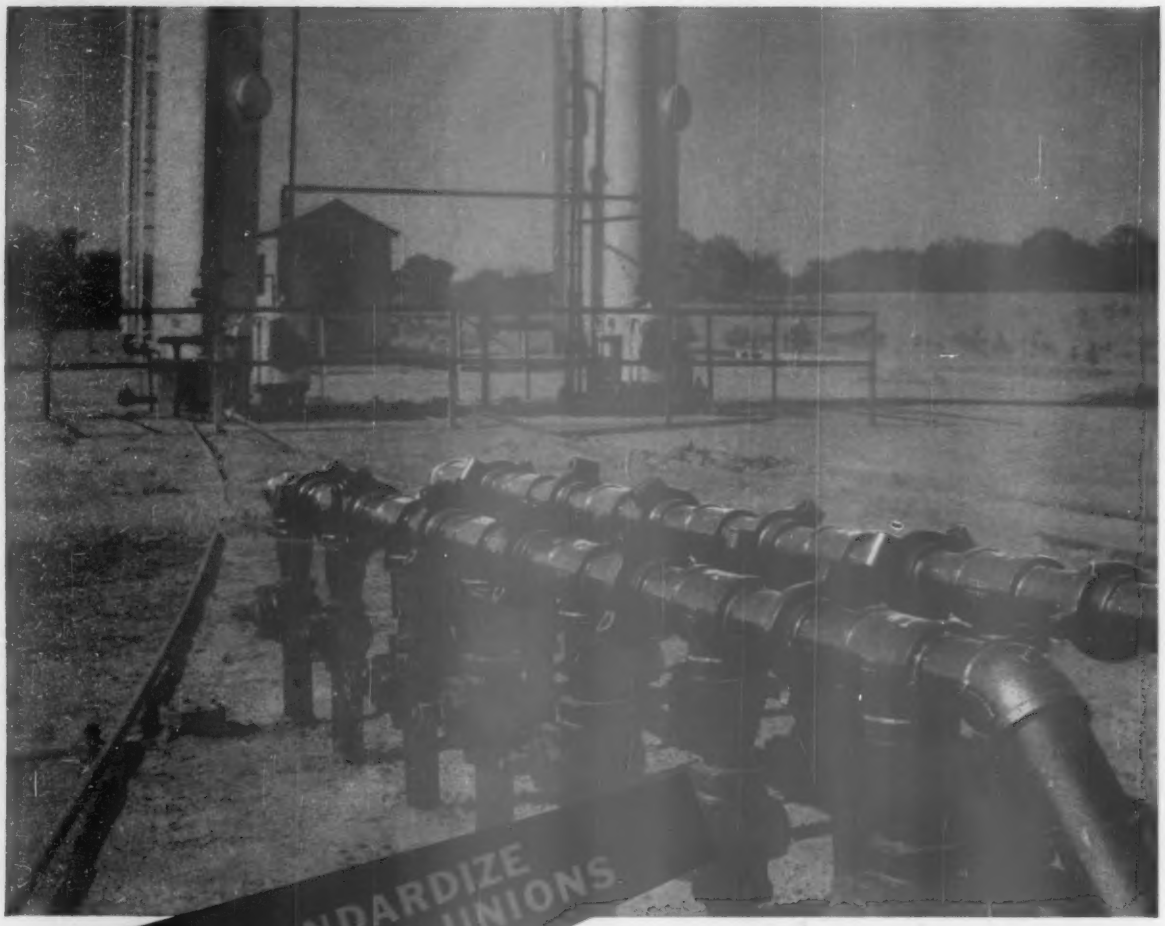

the key to streamlined, economical production hook-ups

When laying field lines, setting tank batteries, separators, heaters, treaters, etc.—when assembling headers and manifolds, WECO Unions are your best, most dependable, leakproof connections. The ball and cone seat seals leakproof with just a few turns of the wing nut. The precision-cut pipe threads on the subs fit perfectly, run up fast and leakproof without galling or damage.

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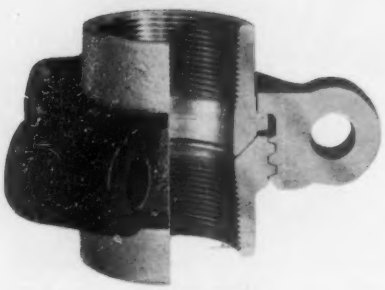
Next time and every time, specify WECO Unions, and you will soon have your standardization program complete, saving you time and money for years ahead. Talk to your WECO Representative or your Supply Store for WECO UNIONS.



WECO Fig. 100
1000 psi test
Sizes: 2" thru 8"

This popular 3 lug "Bar Nut" union is ideal for production installations. Completely interchangeable.

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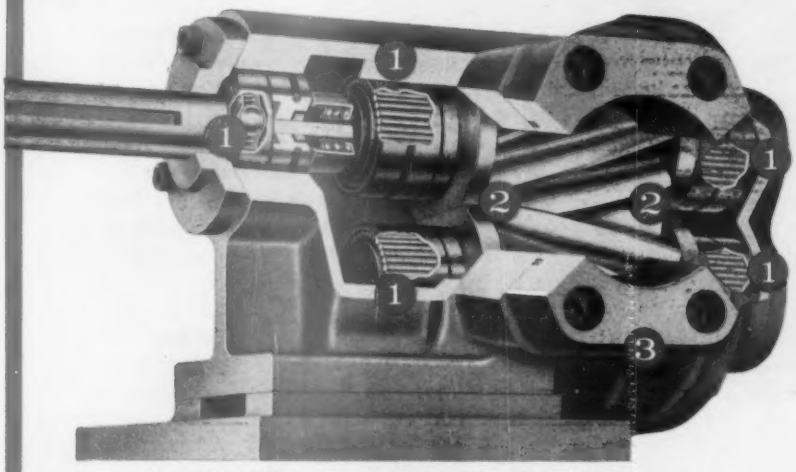
HOUSTON, TEXAS
Division of CHIKSAN COMPANY *a subsidiary of* FOOD MACHINERY AND CHEMICAL CORPORATION

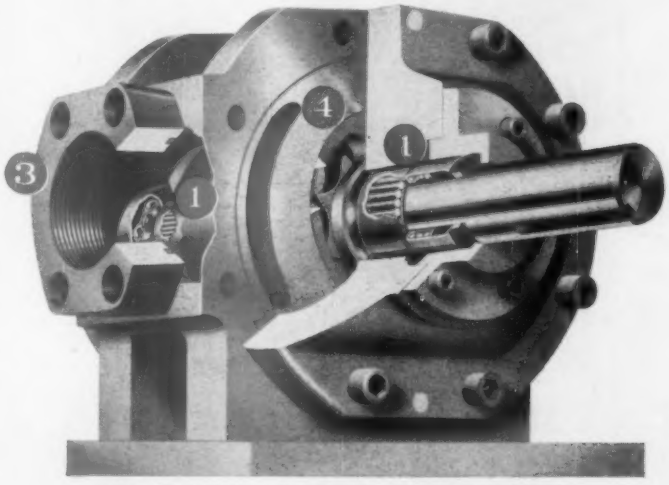
U-2-61

Now from Brown & Sharpe . . .

New rotary pumps with extra long life - built for the Petroleum Industry



New B&S "300" series rotary gear pumps. For pressures to 300 psi; caps. of 40, 60, 90, 125, 175 gpm.



New B&S "700" series gerotor pumps. For pressures to 1000 psi; caps. of 20, 30, 40, 60, 80 gpm.

1. Heavy duty, needle-type antifriction main bearings for radial loads and ball thrust bearings for axial loads in all pumps.

2. Replaceable wear plates prolong pump life. You replace plates after normal wear, not pumps.

3. Available with plain or threaded pipe flanges which can be quickly changed by removing flange screws. Removable flanges eliminate pump replacements caused by damaged welds or threads. Pumps can also be removed easily from the line, without disturbing piping.

4. Unique gerotor design gives exceptionally long life to the Brown & Sharpe "700" series gerotor pump. Rolling contact between the inner and outer elements progresses at a relative speed only ⅛ that of driven speed.

You save on installation and maintenance, too

These new Brown & Sharpe Pumps have been designed and perfected specifically for the Petroleum Industry, to save you money right down the line. Start saving now.

Contact your oil field supply house about new Brown & Sharpe pumps. Ask them for a catalog, or write: Hydraulics Div., Brown & Sharpe Mfg. Co., Providence 1, R. I.

Brown & Sharpe PRECISION CENTER

Servo Power satisfies more

in Taylor TRANSCOPE® Electronic and Pneumatic

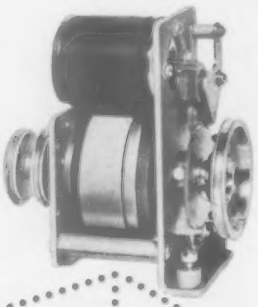
Powerful SERVOMATIC motors in Taylor TRANSCOPE Recorders not only give you greater recording accuracy than ever before, they also supply the power necessary for precision operation of auxiliary mechanisms and computing devices. Power in the pneumatic servo is 150 times greater than the bellows type; in the electronic it's 1,000 times greater than galvanometer systems.

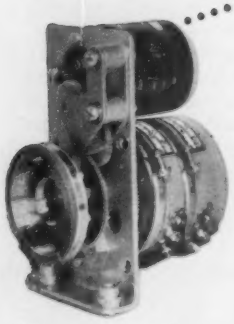
This means closer measurement of temperature, pressure, flow, flow ratios, pH and other process variables—whether the signals are pneumatic or electric. Accuracy of ½ of 1% is standard, ¼ of 1% optional.

You economize with servo power because you no longer need conventional "black boxes" for auxiliary functions. You save on panel space . . . and installed cost.

Optional features made possible by servo power include integral process alarms, retransmitting potentiometers, function generation and digital output with encoder discs. Ask your Taylor Field Engineer to demonstrate the built-in plus value of servo power in the TRANSCOPE line. Or write for **Bulletin 98286** (Pneumatic) or **98335** (Electronic). Taylor Instrument Companies, Rochester, New York, or Toronto, Ontario.

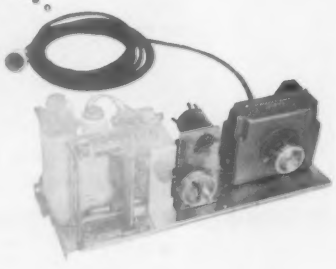
700J ELECTRONIC SERVO MOTOR
Precision gearing couples servo to a precise feed-back device with high torque. Built to military specifications.





RETRANSMITTING POTENTIOMETER
permits numerous computations such as $\frac{x}{xy}$, $\frac{xy}{y}$, $\frac{}{x}\sqrt{x}$.

INTEGRAL ALARMS
cost approximately 1/3 as much as conventional external "black boxes".



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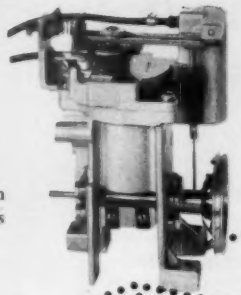
—servo motor permits use of compact, high accuracy, integral encoders.

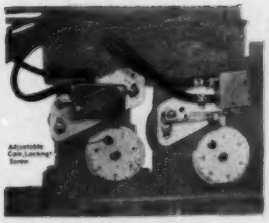
Taylor Instruments

process needs more economically

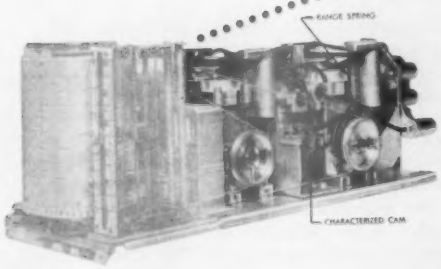
Recorders



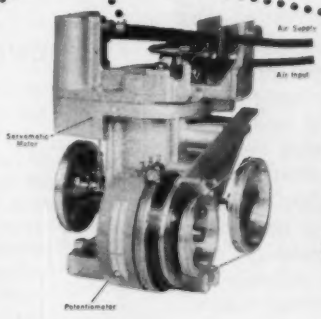
90J PNEUMATIC SERVO MOTOR
Essentially a power piston with built-in positioner. Solid construction assures long, trouble-free life.



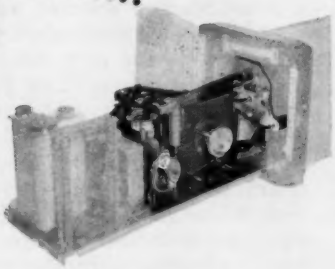
INTEGRAL ALARMS
Alarm points convenient to set on calibrated dials.



FUNCTION GENERATOR
puts square root extraction and other similar functions within recorder.

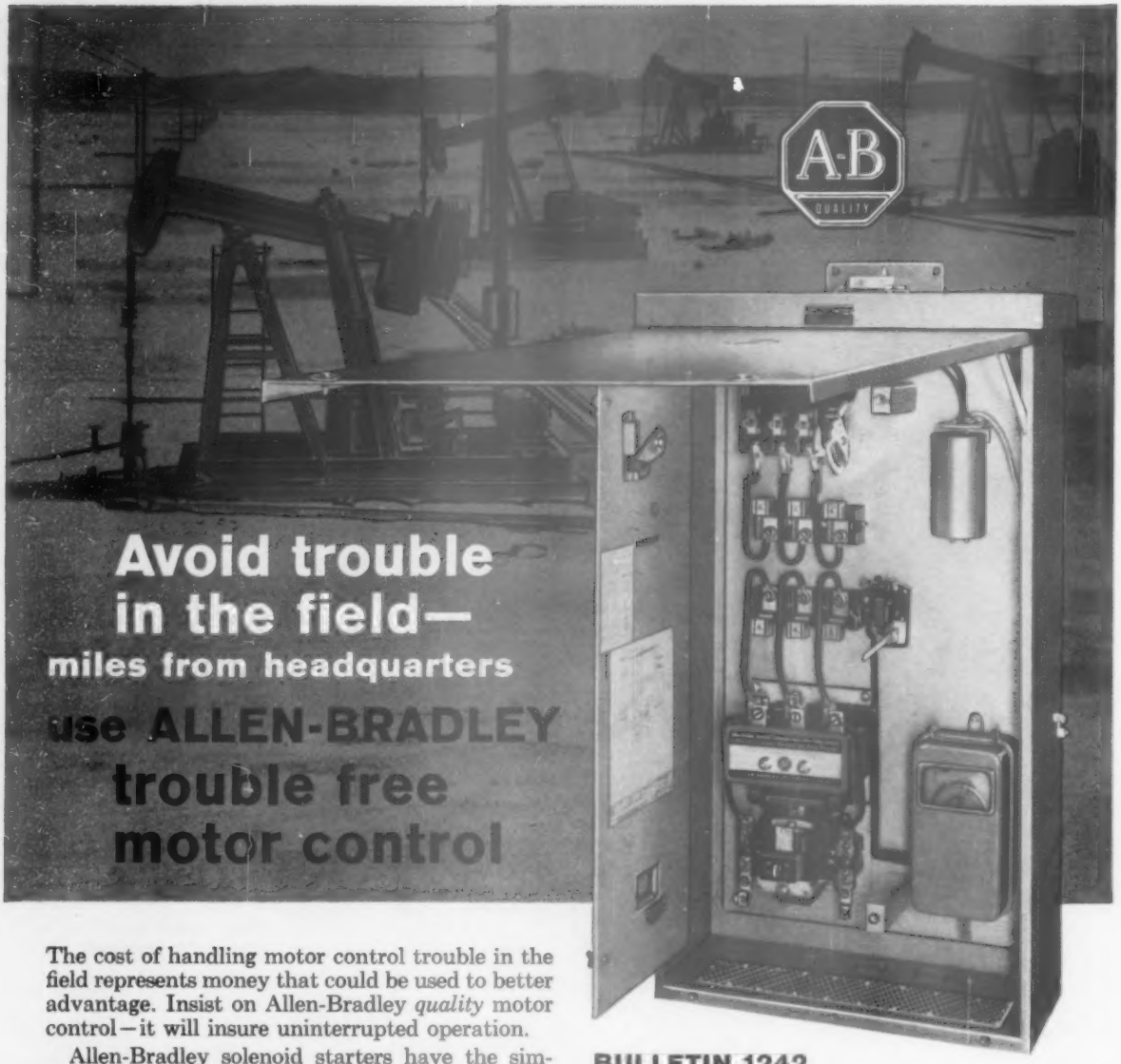


POTENTIOMETER
costs about half as much as usual "black box" transducers.



DIGITAL ENCODER
sets new standards of accuracy for pneumatically driven encoders.

MEAN ACCURACY FIRST



The cost of handling motor control trouble in the field represents money that could be used to better advantage. Insist on Allen-Bradley *quality* motor control—it will insure uninterrupted operation.

Allen-Bradley solenoid starters have the simplest switching mechanism yet devised—there is only ONE moving part. Such design simplicity is, in itself, a safe guarantee for millions of trouble free operations. Trouble-causing bearings, pivots, and flexible jumpers have all been eliminated.

The double break, silver alloy contacts—standard on *all* A-B controls—never need service attention of any kind. Allen-Bradley starters are equipped with two or three reliable and permanently accurate thermal overload relays.

To insure that your remote installations "stay on the job" without attention, insist on Allen-Bradley—the quality motor control that's built to be installed and forgotten.

BULLETIN 1242

control panels are complete units for automatic operation of oil well pumps. A similar line—Bulletin 1232-3 for irrigation and other pumping requirements—is available. All use the popular A-B solenoid contactor with maintenance free contacts. Accurate overload relays insure safe pump operation up to rated capacity—without nuisance dropouts. The fused disconnect switch, contactor, overload relays, and undervoltage relay are in one compartment, and the door cannot be opened unless the switch handle is in the OPEN position. Lightning arrester and program timer are also included. The NEMA Type 3 enclosure provides reliable protection in all types of weather. Bulletin 1243 pump control panels have the same features but use ITE instantaneous trip circuit breaker as disconnect means. Send for Publication 6089.

Allen-Bradley Co., 1304 S. Second St., Milwaukee 4, Wis. • In Canada: Allen-Bradley Canada Ltd., Galt, Ont.

ALLEN-BRADLEY
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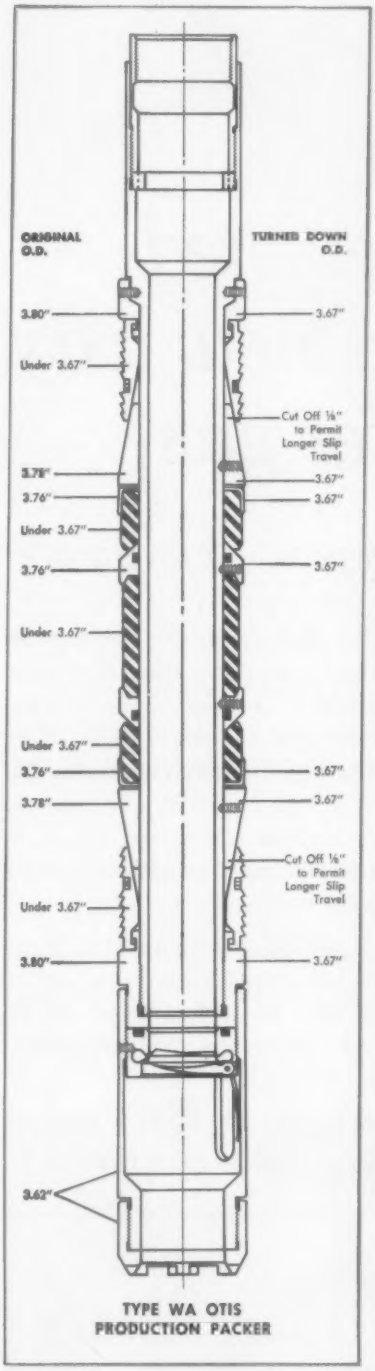
QUALITY MOTOR CONTROL

OTIS PRODUCTION NEWS

Volume I, Number 3 **Otis Engineering Corporation • Dallas** *Production Equipment and Services*



TYPE WA OTIS PRODUCTION PACKER

Two Standard Model 4½" Otis Production Packers Turned Down To 3.67" O.D. And Set in 5" Drill Pipe

HOUMA, LA. – Otis packer specialists from the Belle Chasse and Houma divisions recently solved an extremely difficult well completion problem for one of the major producing companies in their area, by turning down and setting two of their standard model 4½-inch Type WA Production Packers between tool joints in stuck 5-inch drill pipe. The fact that these packers could be turned down from their normal 3.80-inches to 3.67-inches and set in 4.30-inch I.D. pipe, saved the operator a considerable amount of rig time in addition to the cost of having special packers designed and built.

Well conditions at the time the Otis specialists were called in were as follows: 12,500 feet of 5-inch, 19.50-pound drill pipe had become stuck in a salt water flow during final drilling operations and could not be freed. As a result, the pipe had been cemented in place at that depth and cut off at 2900 feet, then tied back to the surface with 7-inch, 29-pound casing. The only potential producing interval was located at 11,600 feet. Before attempting to bring in the well, the operator wanted to plug below, and set a packer above, the potential zone.

Probably the most serious problem facing the Otis specialists on this particular job was the fact that the operator wanted the packers set in the pipe between tool joints. This meant any packer run into the well would have to have an outside dimension of less than 3.75-inches to pass through the tool joints, yet have a sufficient range to set and hold in the 4.30-inch I.D. pipe. Although none of the standard production packers or bridge plugs available today are designed to cover this range, the Otis specialists felt confident their packer could be turned down and run. In the interest of time and cost, the operator agreed to try it.

After first running a 3.68-inch O.D. junk basket to 11,800 feet, the first Otis packer, equipped with an expendable sealing unit, was run in to 11,744 feet and set. In that this packer was to serve as the bridge plug, it was set 4 feet below a tool joint so that the cement to follow would straddle the joint and give a stronger plug. Running time was approximately 5½ hours, due to the viscosity and weight of the drilling mud. Once set, three dump bailer loads of cement were placed on top of the packer and allowed to set for 12 hours. At the end of that time, the plug was tested to 3500 p.s.i. Where fluid had been lost through the bit prior to plugging, there was no bleed down of pressure.

Next, the drill pipe was perforated and squeezed below and above the intended producing interval and the zone itself perforated. With these operations completed, another turned-down Type WA Packer was run and set between tool joints at 11,570-feet. A successful test to 1500 p.s.i. convinced the operator the packer would hold and swabbing operations to bring in the well were begun.

The help given this operator by his local Otis packer and completion specialists is typical of the service available from all Otis field personnel. Their knowledge of production problems and of the application, installation, and capacity of their equipment permits them to make sound, on-the-spot recommendations. The next time you find it necessary to consult with someone regarding packers or well completion techniques, call the Otis office nearest you or write Otis, Department 3-P, Box 35206, Dallas 35, Texas. You'll find experienced Otis well completion specialists ready to help you – anxious to serve you. © *1960 O. E. C.*

OTIS

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General Offices:

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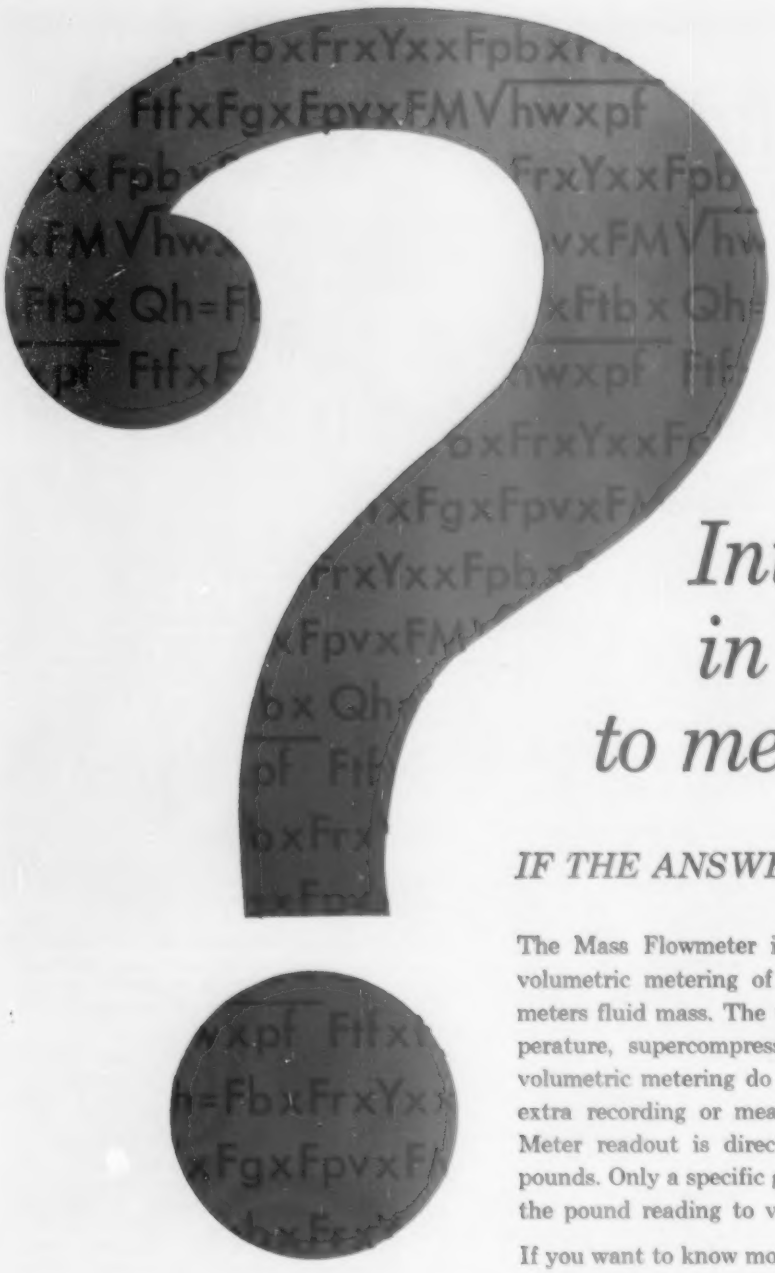

Interested in a new way to meter gas?

IF THE ANSWER IS NO...READ THIS!

The Mass Flowmeter is the first significant challenge to volumetric metering of flowing gas. The Mass Flowmeter meters fluid mass. The volumetric variables—pressure, temperature, supercompressibility and the rest—which affect volumetric metering do not affect the Mass Flowmeter. No extra recording or measuring instrumentation is required. Meter readout is direct, immediate and accurate . . . in pounds. Only a specific gravity reading is required to convert the pound reading to volume.

If you want to know more about the BS&B True Mass Flowmeter contact your BS&B sales representative or write: BLACK, SIVALLS & BRYSON, INC., MASS FLOWMETER SALES, P.O. Box 1714 Dept. 3-A1 Oklahoma City, Oklahoma.

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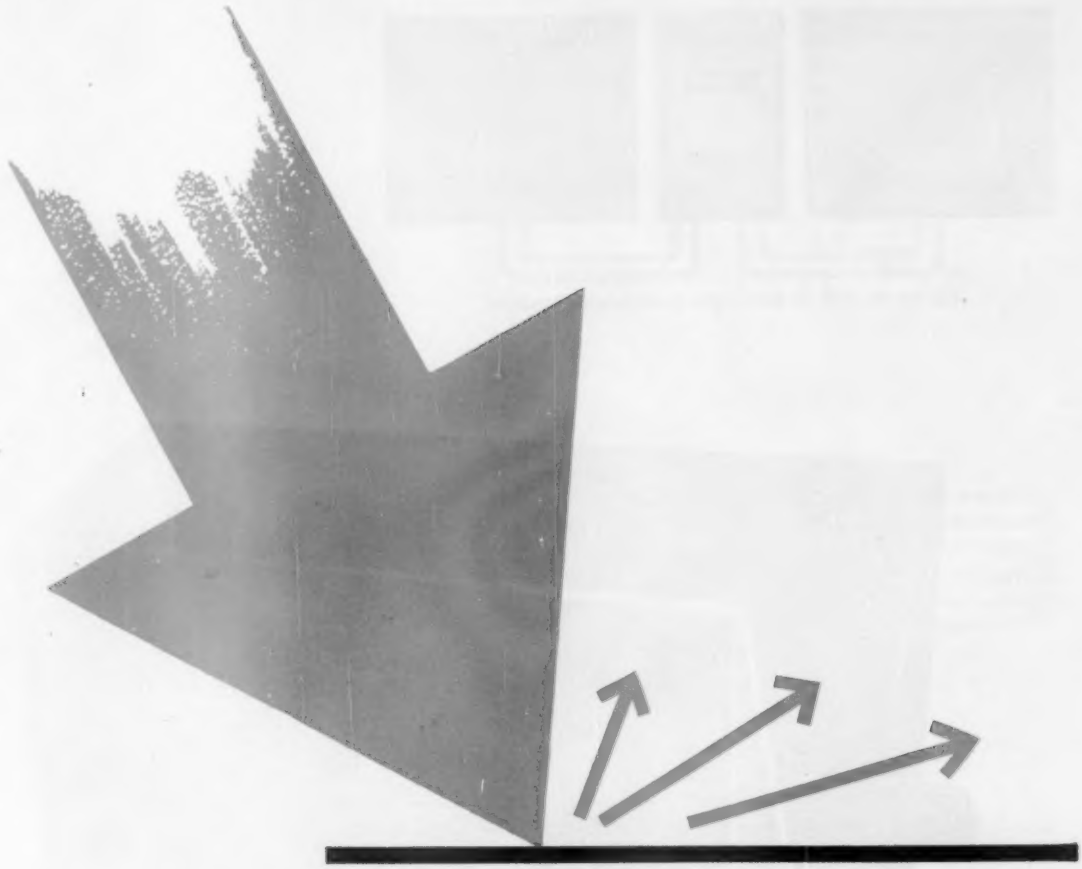
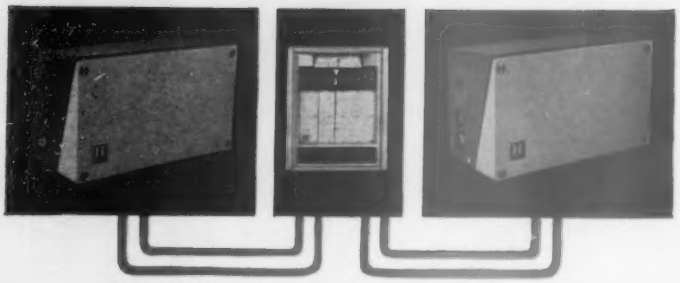


Metallurgical Phenomena... and the metals to cope with them.

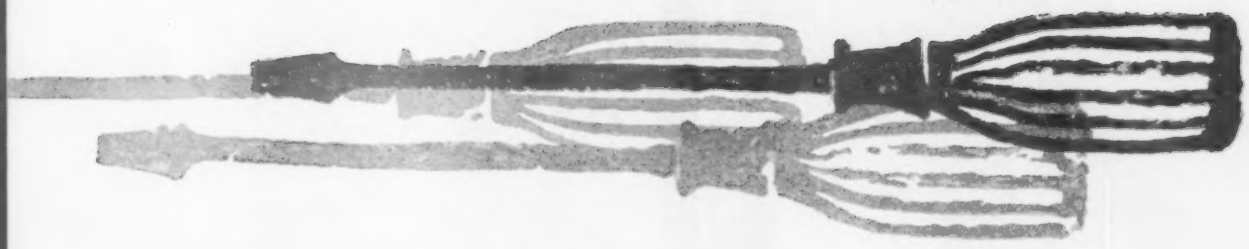
These are the stock-in-trade of the Lukens Application Engineer—whether the problem be one of abrasive impact (symbolized above) or corrosion or pressure or structural stress or high and low temperature. Investigation of the best steels for "problem" applications has been carried on for years by the Lukens Application Research team. We would welcome the opportunity to contribute the results of this research to your own design knowledge. Please contact us in your early design stages. Call collect: Joe Proctor, Manager of Application Engineering, Extension 422, Lukens Steel Company, Coatesville, Pennsylvania.

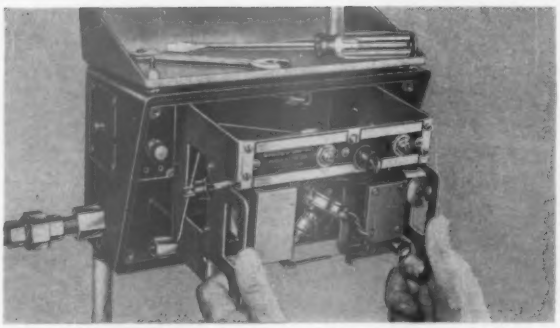
HELPING INDUSTRY CHOOSE STEELS THAT FIT THE JOB



***ElectriK Tel-O-Set*—the true 2-wire system**

NO STAND-BY SUPERVISION





No stand-by supervision needed when you install an *ElectriK Tel-O-Set* Control System. Installation crews never have to open an instrument cover to hook up the line . . . instrument crews never have to touch an outside line to service an instrument.

It's all in the *Tel-O-Set* connection system. All process connections are entirely isolated from the inside of the instrument case. Installation crews can mount, pipe, and wire the various *Tel-O-Set* instruments without removing the cover. Instrument chassis can be removed for servicing without breaking any external process or electrical connection. Standardized parts, together with extensive use of quick-connect and plug-in design, minimize downtime and reduce spare parts inventory.

And there's more to the *ElectriK Tel-O-Set* economy story. Specifically, there's no external power required at any field-mounted *Tel-O-Set* instrument. Line power connection is made only at the receiver. Two-wire d-c transmission reduces installation costs and eliminates shielding problems. Also, the 4-20 milliamp signal range of the system gives a live zero and permits the use of the most reliable transistors available. The d-c signal can be fed into data handling systems and millivolt-actuated instruments . . . can be easily transduced to a standard 3-15 psi pneumatic signal to operate existing pneumatic systems.

Take a new look at your control problem with the *ElectriK Tel-O-Set* System in mind! Get the complete economy story from your local Honeywell field engineer. Call him today . . . he's as near as your phone. MINNEAPOLIS-HONEYWELL, 21 Penn Street, Fall River, Massachusetts.

Honeywell

First in Control

SINCE 1885

Clean jet fuel is essential to safe jet aircraft operation. Today, all aviation fuels in current service may be provided the ultimate protection against fuel contamination. The new Warner Lewis 2-stage separator/filter eliminates jet fuel contaminants — free water and dirt. This new equipment developed by Warner Lewis Company, pioneer manufacturer of separator and filter equipment for aviation fueling, delivers the cleanest fuel ever demanded by commercial or military aircraft.

A Silent Servant of Safety, this equipment is installed at the fixed facilities and on refueler trucks and hydrant carts serving most of the world's major airports. It is approved and in production for the U. S. Air Force under recent contracts. For further information, write Aviation Products division, Warner Lewis Company.

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They Say—

Hooray for new look

Dear Sir:

I noticed the innovations in your January 2 issue (see "Journally Speaking," Jan. 2, p. 39) and particularly wanted to comment on the large improvement made in the binding.

Having the magazine flat when open and being able to tear out certain sheets for filing is certainly a step forward! Congratulations . . . you have done a fine job.

C. E. Thornton, President
Reading & Bates, Inc.
Tulsa

Dear Sir:

Congratulations for giving us the "new frontier" binding! Actually, I didn't support the new administration but have been told that the "new frontier" is here. If this is something we have to look forward to, I certainly must concede that I like the change.

I do on many occasions preserve copies of articles in the Journal, and the new flat binding is certainly going to be a big help to me.

As I went through this new issue reading my favorite articles, I noted that it flattened out with the turn of each page . . . nearly as flat, in fact, as my pocketbook after Christmas.

All of us in the Pipe Line send congratulations.

Walter E. Biery, President
Mid-Continent Pipe Line Co.
Tulsa

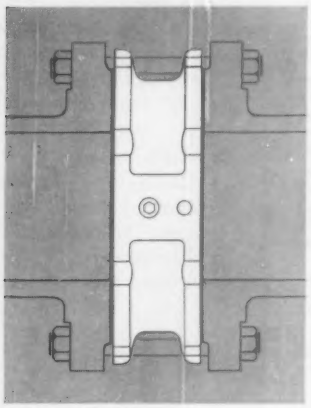
Dear Sir:

Congratulations on your "compact with the impact." I, too have been doing research on type to be used and find that the bigger type and easier reading definitely get better results.

Your new glue goo has yet to prove itself in staying ability but there is no question about the excellence of handling provided by this new binding.

For the first time I have actually taken time to read all of the ads

The Duo-Chek® is easily lowered into position between the flange faces; because of its light weight, special handling equipment is unnecessary. Fits standard valve flanges. In sizes 2 inch through 12 inch, one valve fits series 125, series 150 and series 300 flanges, saving inventory at less cost than a conventional 150 series. The machined outside diameter centers the Duo-Chek between series 300 flanges; the slots center it for series 150 flanges.



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MISSION VALVE AND PUMP CO.

because the pages were so easy to turn.

Many thanks to you for improving an already excellent magazine.

Charles J. Pardee,
Executive Secretary
Illinois Oil and Gas Association
Mount Vernon

Dear Sir:

The greatest advance since the invention of the Bowie knife! As an avid "tearer-outer" of practically anything published in the Big Yellow Book, your new perforated pages make the effort really worth the effort.

Sherman A. Wengerd
Professor of Geology
University of New Mexico

Dear Sir:

Thanks! Now we can clip pages neatly.

T. J. Mouché
United Geophysical Corp.
Pasadena, Calif.

Dear Sir:

Congratulations on your new binding. Now everyone will be happy—the librarians because they will no longer have a binding problem and the clippers who now can rip to their hearts' content.

Many thanks from one librarian. I have heard from several others who are very pleased with this improved type and the exit of the perforated pages. They feel that The Oil and Gas Journal has been most cooperative and are about to use it as an example to other journals which are persisting in using the perforated pages.

Virginia M. Smyth, Librarian
American Petroleum Institute
New York

Dear Sir:

I like the new type size. It does make for easier reading.

John R. Rowe,
Educational Director
Encyclopedia Britannica
Chicago

Dear Sir:

I enjoyed the article on the "new look and feel" of The Oil and Gas Journal (Jan. 2, "Journally Speaking," p. 39).

The new binding does make it nicer to handle and the good Lord knows we can all use a little help these days in the bifocal department —not that we're getting old!

Olivia Starken, Office Manager
Jerry Robertson's Tri-State
Oil Report
Evansville, Ind.

Dear Sir:

Thank you, thank you for these thoughtful improvements. They weren't needed, but they are welcome.

Bernard S. Fredman,
Research Associate
Sinclair Research Labs, Inc.
Harvey, Ill.

Dear Sir:

Being a member of the bifocal set, I am pleased with the new type. One constantly hears "I can't read fast enough to cover everything." You apparently will attempt to help this by more concise writing and bigger print making it easier to read.

I also like the pages as now arranged as I am also a member of the "page-tearer-outer" group. The book lying flat also helps in reading and handling.

In other words, I like what you have done.

A. G. Viola, Regional Director
Wagner Electric Corp.
Kansas City

Letters to They Say should be addressed to The Editor, The Oil and Gas Journal, Box 1260, Tulsa, Okla.

CALENDAR

JANUARY

17-19 Kentucky Petroleum Marketers Association, annual meeting and convention, Brown Hotel, Louisville.

18 Institution of Mechanical Engineers (Great Britain), symposium on pressure vessel research toward better design.

19-20 API Committee on Public Affairs, Los Angeles regional conference on employe communications, Statler-Hilton Hotel, Los Angeles.

20 Natural Gasoline Association of America, Gulf Coast regional meeting, Robert Driscoll Hotel, Corpus Christi, Tex.

20-21 Association of Oilwell Servicing Contractors, fifth annual convention, Dallas.

22-24 Kansas Oil Men's Association, annual

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convention, Broadview Hotel, Wichita.

24-27 Society of Plastics Engineers, seventeenth annual technical conference, Shoreham Hotel, Washington, D. C.

25-27 Texas A & M College, sixteenth annual symposium on instrumentation for the process industries, College Station, Tex.

26-27 American Chemical Society, Southeastern Texas Section, fourth symposium on hydrocarbon chemistry, Shamrock Hilton Hotel, Houston.

30-Feb. 9 University of Illinois, annual quality control short course, Urbana, Ill.

FEBRUARY

2 Petroleum Equipment Suppliers Association, south Mid-Continent district meeting, Statler Hotel, Dallas.

7 Petroleum Equipment Suppliers Association, Gulf Coast district meeting, Shamrock-Hilton Hotel, Houston.

7-8 University of Oklahoma, School of Petroleum Engineering, advanced petroleum engineer seminar, University of Oklahoma, Norman.

8-10 Southwestern Legal Foundation, twelfth annual institute on the law of oil, gas, and taxation, Southwestern Legal Center, Dallas.

9-10 API Committee on Public Affairs, New Orleans regional conference on employe communications, Roosevelt Hotel, New Orleans.

9-11 National Society of Professional Engineers, winter meeting, Hotel Fort Des Moines, Des Moines, Iowa.

14 Petroleum Equipment Suppliers Association, eastern district meeting, Duquesne Club, Pittsburgh.

14-15 National Association of Corrosion Engineers, Shreveport, La., section, short course, Centenary College, Shreveport.

15-16 Western Petroleum Refiners Association, Gulf Coast regional technical-industrial relations meeting, Rice Hotel, Houston.

16 API Committee on Public Affairs, Dallas regional conference on employe communications, Sheraton-Dallas Hotel, Dallas.

18 Purdue University, business history conference, "Management Decisions Under Government Regulation," Memorial Union, Purdue University, Lafayette, Ind.

20-Mar. 11 Advanced Drilling Practices Course for Engineers, University of Oklahoma, Norman.

23-24 Oklahoma State University, natural-gas conference, Stillwater, Okla.

24 Natural Gasoline Association of America, South Louisiana regional meeting, Lafayette Petroleum Club, Lafayette, La.

26-Mar. 1 American Institute of Chemical Engineers, petrochemical and refining exposition, Municipal Auditorium, New Orleans, and national meeting, Hotel Roosevelt, New Orleans.

26-Mar. 2 American Institute of Mining, Metallurgical, and Petroleum Engineers, annual meeting, Chase and Park Plaza Hotels, St. Louis.

27 Canadian Society of Exploration Geophysicists, conference on exploration geophysics—today and tomorrow, Palliser Hotel, Calgary.

28-Mar. 1 API Committee on Public Affairs, New York regional conference on employe communications, Park-Sheraton Hotel, New York City.

MARCH

2 Petroleum Equipment Suppliers Association, north Mid-Continent district meeting, Mayo Hotel, Tulsa.

3 Ohio Oil and Gas Association, winter meeting, Deshler Hilton Hotel, Columbus.

5-9 American Society of Mechanical Engineers, gas-turbine power division, and U. S. Department of Defense, annual gas-turbine conference and products show, Shoreham Hotel, Washington.

7 Petroleum Equipment Suppliers Association, Pacific district meeting, Ambassador Hotel, Los Angeles.

7-8 University of Oklahoma, School of Geological Engineering, seventh biennial geological symposium, Student Union Building, University of Oklahoma, Norman.

8-9 API Committee on Public Affairs, Chicago regional conference on employe communications, Sheraton-Towers Hotel, Chicago.

8-10 American Petroleum Institute, Division of Production, southern district meeting, Captain Shreve and Washington-Youree hotels, Shreveport, La.

13-16 Kentucky Petroleum Marketers Association, sixth management institute, conducted by the University of Louisville, Brown Hotel, Louisville.

13-17 National Association of Corrosion Engineers, annual meeting and corrosion show, Hotel Statler, Buffalo, N. Y.

15-17 Natural Gasoline Association of America, annual convention, Baker Hotel, Dallas.

16-17 International Oil and Gas Educational Center, study of the economics of petroleum exploration, development, and property valuation, Southwestern Legal Center, Dallas.

21-23 American Power Conference, twenty-third meeting, Sherman Hotel, Chicago.

21-30 American Chemical Society, 139th annual meeting, Kiel Auditorium, St. Louis.

22-24 American Petroleum Institute, Division of Production, southwestern district meeting, Cole Hotel, Albuquerque.

23 National Industrial Conference Board, general session, Shamrock-Hilton Hotel, Houston.

27-28 University of Wichita, School of Engineering, third annual production institute, university campus, Wichita.

27-29 Midwest Gas Association, annual meeting and convention, Sheraton-Fontenelle Hotel, Omaha.

27-31 Instrument Society of America, symposium on temperature measurement and control in science and industry, Veterans Memorial Auditorium, Columbus, Ohio.

28-29 University of Oklahoma, Schools of Petroleum and Gas Engineering, gas conditioning short course, Oklahoma Memorial Union Building, University of Oklahoma, Norman.

APRIL

4-5 University of Kansas, gas compressor institute, Liberal, Kans.

5-6 Third annual symposium on pilot plant and process automation, Ambassador Hotel, Los Angeles.

5-7 American Petroleum Institute, Division of Production, Mid-Continent district meeting, Mayo Hotel, Tulsa.

6-7 University of Oklahoma, School of Mechanical Engineering, short course on industrial engines, University of Oklahoma, Norman.

7-9 American Institute of Mining, Metallurgical, and Petroleum Engineers, Southwestern Alaska Chapter, sixth annual mining, minerals, and petroleum conference, Anchorage, Alaska.

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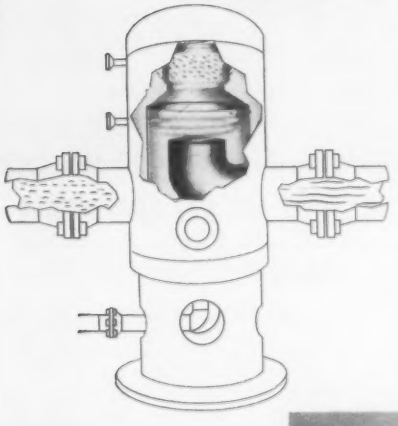
FROM HYDROCARBON GASES



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You can bet on it, Charlie!

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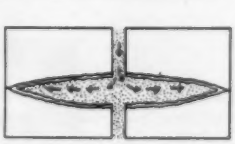

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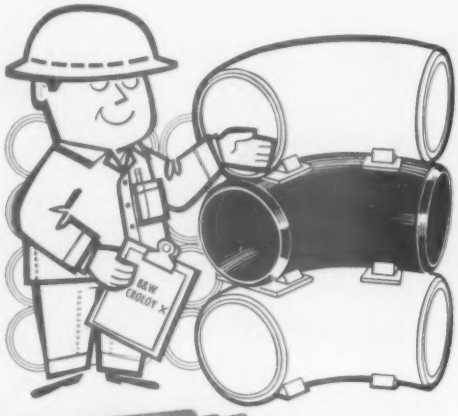

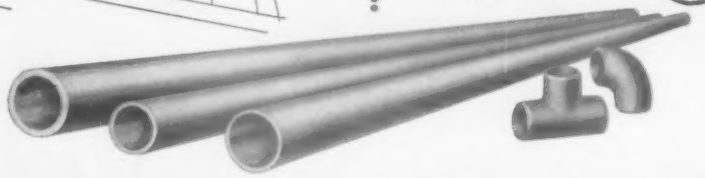

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The Babcock & Wilcox Company, Tubular Products Division, Beaver Falls, Pa.

Steel

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the Journal said...

50 years ago

January 19, 1911

Midland Valley Railroad initiates "Oil Special" daily train from Tulsa to Pawhuska, county seat of the Osage Reservation. New service to accommodate the increasing volume of travel by oil men between these cities because of the new Osage oil boom. Business interests of Tulsa and Cleveland, Okla., are working with Katy Railroad officials to get a daily oil-field special train between these places.

World's biggest oil producer blows in at Potrero del Llanos, 85 miles southwest of Tampico, on the Mexican Gulf Coast. Flow of new Mexican Eagle Petroleum Co.'s well is estimated at 125,000 bbl. daily. At depth of 2,069 ft., it is region's deepest well.

Early boom days of the Gulf Coast's flush salt-dome fields are being relived at the new Vinton field in Southwest Louisiana where big gushers are coming in right and left boosting daily output to 27,000 bbl.

25 years ago

January 16, 1936

General crude-oil price increases ranging from 5 to 20 cents per barrel over the entire country, except California, send the year 1936 off to an auspicious start. Big boost in drilling predicted.

Michigan refiners spend $2,000,000 in new construction and additional facilities. Six new skimming plants with daily crude capacities of from 300 to 2,500 bbl. are completed during year. Seventh new plant nears completion. Increase of 5,400,000 bbl. in year's oil production to total of 16,000,000 bbl. crowds refining and pipeline outlets.

10 years ago

January 18, 1951

Drilling begins on first full-fledged offshore drilling venture in the Persian Gulf. Arabian American Oil Co. deep test located in 19 ft. of water 3 miles from shore, and 20 miles south of Ras del Misha'ab. The operation uses a platform-supported rig, supplemented by four barges.

Platte Pipe Line Co. lets contracts for construction of 1,072-mile, 20-in. crude-oil pipeline from Central Wyoming oil fields to the Wood River-St. Louis refining area. R. H. Fulton, Lubbock, Tex.; O. R. Burden, Tulsa; Bishop & Lock, Dallas; and Ramsey Brothers, Houston, divide contracts.

JOURNALLY SPEAKING

The King and Us

THE REGAL reader on the right is the world's newest royal royalty owner, His Majesty, Mohammed Zaghir Shah, King of Afghanistan, getting his first peek at the world's greatest oil publication.

The gleam in His Majesty's eye is caused by the fact that Afghanistan has just brought in its first producing oil well, and the King perhaps was thinking that his country, too, might now be able to develop an industry like that portrayed in the Big Yellow Book.

The man introducing Zaghir Shah to the Oil Man's Bible is not (officially) a Journal subscription salesman. He is Bradley Murray, an official of the U. S. Department of Commerce, who headed a trade mission to the landlocked Texas-sized nation surrounded by Pakistan, Iran, Soviet Turkestan, and Red China.

As a matter of fact, we probably know a lot more about King Zaghir's oil business than he knows about ours.

Afghanistan's only oil well was brought in last summer by the Russians, who got exploration concession on the northern half of the country as part of a 1957 economic agreement. The well is only 40 miles south of the USSR border. When the well came in the Russians made fantastic estimates of enormous reserves underlying the whole country. Later the Afghan Government announced that the well would produce 140 bbl. per day.

The King would like to have American companies find oil to the south of the country's mountainous backbone, where it would do the Afghans some good. To this end he has concluded an investment-guaranty treaty with the U. S., and is drafting a commercial code and a petroleum law.

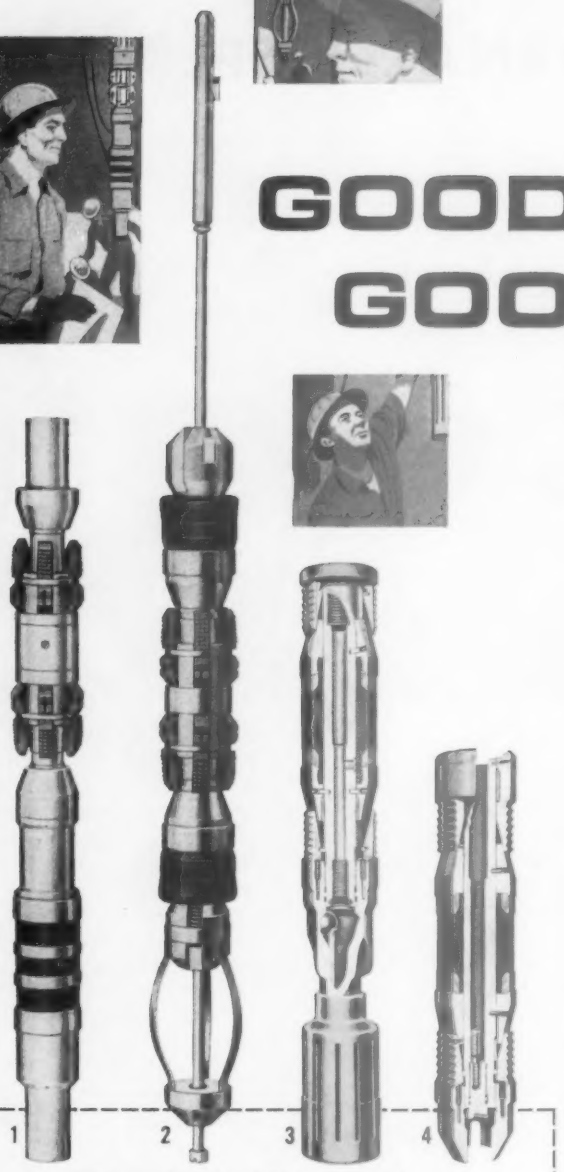
Developments will be duly recorded in the Journal, whether or not the Shah continues his keen-eyed perusal of it.

And even more details may appear in our new sister publication we are launching in Europe this very week—Oil and Gas International. It is primarily for oil men of the Eastern Hemisphere, and won't be seen much on the American continents.

But whether you read OGI or OGJ you will be informed on any progress King Zaghir makes in developing an Afghan oil industry. Long live the King—and us.

—Henry D. Ralph

GOOD MEN GOOD TOOLS



Baker provides the right tool (or tools) and accessories for any remedial or stimulation job.

1 Baker Retrievable Full-bore Cementer (Product 410) is an important squeeze cementing, fracturing, acidizing, testing packer. It is teamed with **2** Baker Retrievable Bridge Plug (Product 677-C) in straddle operations, either single-zone or selective multiple-zone. Cementer and Plug together can straddle a virtually unlimited distance. And any number of zones can be treated in one round trip. **3** Baker Drillable Cement Retainer (Product 400) sets the industry standard for dependable high-performance squeeze cementing. **4** Baker Drillable Wire Line Bridge Plug (Product 400-N) is the industry's most available and most reliable bridge plug.

Dependable remedial and stimulation service demands both. Baker offers both.

YOU ARE LOOKING at four of the most respected well-service tools in the industry. They command respect because their performance is consistent and reliable. They have proved themselves in thousands of critical downhole operations.

Simplicity is important in service tools. A simple tool is a reliable tool—and it is easier to control when it's in the well. Simplicity of design is one important reason for the success of Baker service tools.

YOUR BAKER SERVICEMAN lives and works in your area—and he knows the well-service problems of your area.

His local knowledge is vital. It helps keep him—and you—out of unforeseen situations. It helps him sense trouble before it starts. It guides him—and you—when you get into something you couldn't anticipate.

A Baker Serviceman does his work with confidence and authority. He knows his area, and he knows Baker tools. He's a tool specialist. Baker tools are his *only* business. He's a good man to call for your next remedial or stimulation job.

BAKER REMEDIAL AND STIMULATION TOOLS

BAKER OIL TOOLS, INC. HOUSTON / LOS ANGELES / NEW YORK

What to do about the wage increase

A BIG PROBLEM facing the oil industry this year is how to recoup the general wage and salary increase, averaging about 5%, and estimated to raise industry costs by some $200,000,000.

Various company executives, in announcing the increase, have said that it will have to be passed on to the public through higher prices.

But nobody has said much about how to increase prices. There seems to be just a pious hope that, somehow, oil prices will rise soon.

OIL PRICES seem to be as big a mystery to most oil men as they are to the general public. The average oil man, whether producer, refiner, or marketer, has the attitude that nothing he himself does has any bearing on the situation.

In some industries, such as steel perhaps, one big operator can simply haul off and announce a higher price schedule (justifying it on a wage increase or whatever), all competitors follow, and that's that.

Oil prices aren't that simple. They are the end result of the complex interrelation of a great many competitive and market forces. But the biggest force of all is the relationship of total supply to current market demand.

So if oil men sincerely feel that prices must advance to cover the wage increase, they must sincerely take positive steps to bring about market conditions which will sustain higher prices. This includes those top executives who have publicly expressed the need for higher prices as well as the smallest independent.

First, this means tailoring crude production, refinery runs, and marketing quotas to actual market needs rather than to individual hopes.

Second, this means eliminating marketing practices, from lease tank to consumer tank, that have a tendency to undermine the price structure and invite price wars.

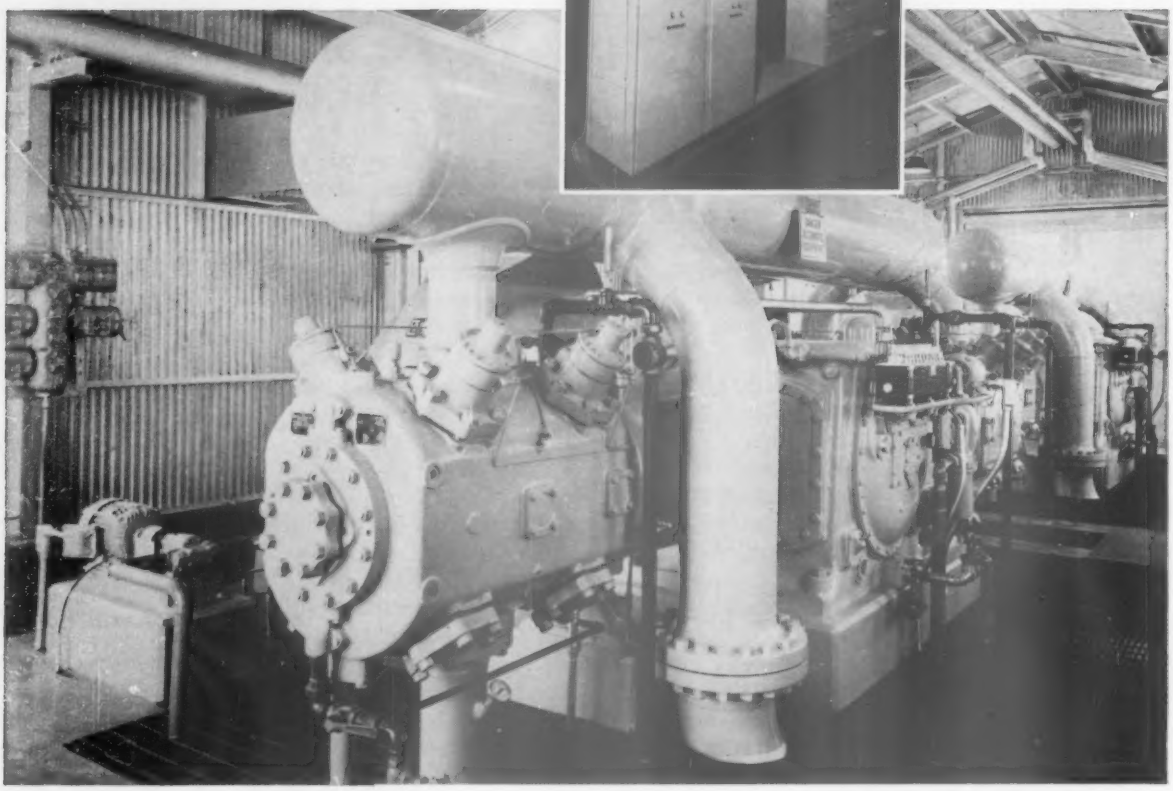
Both measures require individual self-restraint and revision of old habits. But without them the industry won't recover the new wage costs. Higher prices don't just materialize like manna from heaven.

WITHOUT A PRICE RISE, or even with one, the industry must increase its efficiency and productivity and hold down its costs in order to make a decent profit.

Employes must earn their higher pay. Nonessential work and workers must be dropped. Capital investment must increase quality or efficiency rather than mere volume. The harder it is to get prices up, the more necessary it is to bring costs down.

During the past year or two the industry has made much progress in improving its profit margin. The new wage increase simply means that all these efforts must be intensified during 1961.

SR-MATIC
SYSTEM CONTROL



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all made by SR-MATIC, the system that thinks for itself!

From a remote or local set-point, SR-MATIC automatically selects and controls every function of compressor station operation. Manual attendance is reduced to any desired level. Operation has greater safety, continuity and efficiency with SR-MATIC control system by Stearns-Roger, specialists in process plant design and construction.

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Libya—Fastest Growing Oil Area

- Twelve oil fields and a possible thirteenth have been found in 5 years.
- The new crude will be moving to market this year.
- Exploration and drilling activity continues at a whirlwind pace.

SECOND-BEST PRODUCER at Dahra, F-2-32 flows 3,000 bbl. daily into pit.

Paul Swain
International Editor

LIBYA, a standout in the annals of oil hunting, will start channeling its high-quality, light crude oil into an already well-supplied market this year.

Customarily, developers spend a great deal of time and money in "new" oil country before they even think of moving oil to market or of getting any return.

Apparently this won't be the case in Libya.

It's true that a lot of money has been shelled out hunting for oil there—an estimated $370 million since exploration started in 1956.

But in other ways, the traditional pattern of development seems destined to be broken. There's every chance that commercial production will begin in Libya much sooner than it got under way in most other oil areas of the world.

Here's what the country can show so far:

. . . **Twelve oil fields,** two of them sizable, and a possible thirteenth.

. . . **Sixty-three productive** wells, all of them still shut-in awaiting pipeline outlets as the development goes on. The total tested potential of the wells completed at the beginning of 1961 is 115,171 bbl. daily.

. . . **Five gas wells** in addition to this oil potential.

. . . **Only 129 dry holes** giving the country an almost incredible success ratio.

. . . **A busy drilling scene** where 34 rigs are active.

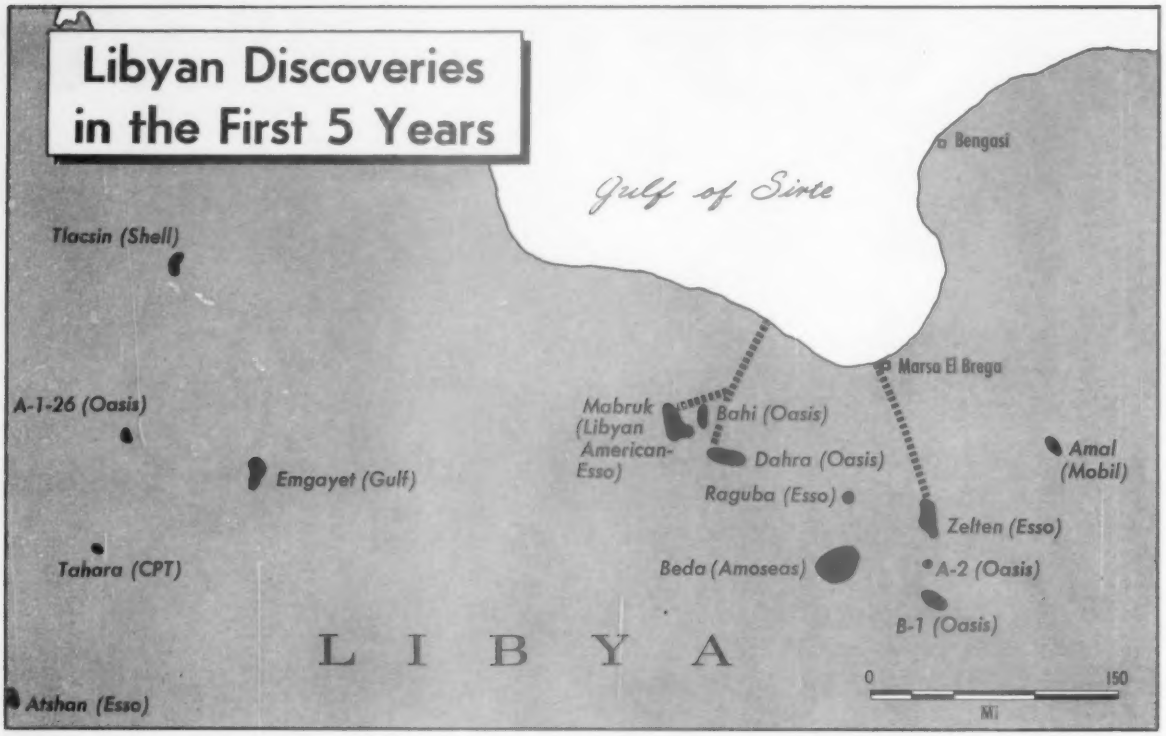
. . . **A still-intensive** preliminary exploration program involving 42 seismic parties.

. . . **Two 30-in. pipeline** projects, one of them already begun, for movement of Libyan oil to the Mediterranean.

It's the last item that dramatizes the speed of the oil development.

Esso Libya, which found the most promising field of all at Zelten, should be moving at least 50,000 bbl. daily by the end of 1961.

Bechtel International is double-



jointing the 30-in. pipe for this line right now. Roadbuilding along the 110-mile route to Marsa el Brega on the Cyrenaican coast began in December. The pipelaying is expected to start this month and the project should be finished within 6 months.

Zelten crude can move at a rate of 150,000 bbl. daily by gravity flow into storage at the Marsa el Brega terminal, if the company desires.

A similar project is planned by Oasis Oil Co. as soon as the government grants a construction permit. Oasis is jointly owned by Continental, Amerada, and Ohio Oil.

This line will run 85 miles from Dahra field to a Mediterranean terminal at Es Sider on the Tripolitanian coast. A spur will connect it with two fields being developed by Esso Sirte-Libyan American. The system's top gravity-flow capacity will be 300,000 bbl. daily.

Oil from the Oasis line will have to be shoe-horned into European markets. Esso, with established affiliates throughout Europe, will have less trouble in making room for the new high-grade crude.

The Oasis owners, who'll market their interests separately, have no European outlets. One, Ohio, has taken on a Spanish partner, Cia. Iberica de Petroleos. But an Ohio proposal to build a 25,000-bbl.-daily refinery on the northern coast of Spain hinges on approval of the Spanish Government and is still hanging fire.

Another of the partners, Continental, has acquired control of one of the biggest independent marketing chains in West Germany and Austria. The new acquisition, Sopi Mineralprudukte G.m.b.H., has 360 retail outlets.

Continental hasn't anonunced any plans for a European refinery, but it could supply Libyan crude to established refiners in exchange for products to market through Sopi.

Esso Libya . . . The most spectacular Libyan discoveries have been by Esso.

It made the first in the country—a one-well field at Atshan in the extreme southwestern part of the province of Fezzan. This well, which tested only a few hundred barrels daily, has been regarded as noncommercial because it's so far from the Mediterranean.

On the same concession block, Esso drilled another 10 wells without finding what it considers a commercial oil producer. But all of these Block 1 wells showed signs of either oil or gas. And now that the company has established production at other locations, it plans to return to this block.

Esso also has seismic and surface parties working in Block 58, farther south in Fezzan.

The big Esso discovery came in 1959. While the company was probing in its 11,000-sq.-mile Block 6, oil shows were found in three wildcats which followed the curve of the Gulf of Sirte. But none of the wells was commercial.

Then Esso moved to the southern part of the block and electrified the oil world with its first wildcat at Zelten.

The discovery had an open-flow test of 17,500 bbl. daily, and the second well tested 15,000 bbl.

Since then, Esso has completed another nine wells in the field. Little has been divulged about these, but the fact that the company has started building a 30-in. pipeline from the area is an indication of the field's potential.

Two more wildcats in the northern part of the same block were dry. But Mn Berber, a sixth northern wildcat 40 miles northeast of Zelten, is drilling below 10,000 ft.

Besides the Zelten field, Esso is

developing two fields on a farmout arrangement with Libyan American Oil Co. on Block 17. The company is drilling a fourth well at Mabruk in the northern part of the block, and a fourth well at Zahaligh to the south.

Mabruk's discovery tested 1,200 bbl. daily of 40°-gravity crude and the Zahaligh discovery was good for 900 bbl. daily of 39°-gravity oil.

To the east in Block 20, where Libyan American had already drilled three wells with noncommercial shows, Esso Sirte apparently is about to tally another field discovery. The company is testing Raguba 1 in the southeastern corner of the block and initial drill-stem tests indicate the well should yield from 500 to 800 bbl. daily of 42°-gravity oil from a 150-ft. horizon.

Oasis Oil . . . The finds made by Oasis have been less spectacular than Esso's, but the combine has established three commercial oil fields in Libya.

Oasis has the distinction of finding commercial oil in its first well, Bahi 1, in the central part of the company's Block 32. The well had a potential of 500 bbl. daily of 40°-gravity sweet oil on pump, but four offsets were dry.

Better luck was with the company when it moved south to the block's Dahra structure. Oasis has completed 22 wells at Dahra in two Paleocene pays. The best of the wells tested 11,500 bbl. daily. Three offsets have proved out.

No time for names

FIELD EXPLORATION has been so successful in Libya and the pace has been so fast that the common practice of naming fields has all but been ignored.

Most Libyan discoveries have been named by individual companies, but in official reports nearly all the succeeding stepouts, extensions, and even wildcats are more familiarly known by number instead of name.

Only last month, the company and the Libyan Petroleum Commission disclosed that Oasis had brought in another producer good for 4,440 bbl. daily of 35°-gravity crude at a location 15 miles to the north. Two offsets are being drilled.

With 12 rigs active, Oasis has the most intensive exploration program in Libya. The company has drilled 28 productive oil wells, three gas wells, and 30 dry holes since it started wildcatting in 1958.

Other operators . . . Other companies have scored in Libya, but all rank behind Esso and Oasis.

American Overseas Oil Co., operating for companies owned by Standard of California and Texaco, has completed five good wells in Beda field southwest of Zelten.

Gulf Oil stands next highest, with four producers in the 650 to 750-bbl. class at Emgayet in Fezzan.

Mobil Oil has logged a successful offset to the Beda field and two producers at Amal, northeast of Zelten.

Shell and the French affiliate of Cie. Francaise de Petrole have two-well finds in western Libya, but drilling in both fields has been disappointing.

Relinquishments . . . For several reasons, exploration has been stepped up during the past 2 years. One factor, of course, was the tantalizing fact that big discoveries had been made. Another compulsion stemmed from the concession law—nearly half of the original 5-year concessions will have expired by May. A concession holder must give up 25% of his holdings at the end of the first 5-year term.

At least four of the 19 companies operating in Libya have already started turning back acreage. Esso Libya, Bunker Hunt, Libyan American, and Oasis have given back 25% of various blocks.

The petroleum commission has said this territory will be held indefinitely as "reserved areas."

But whether or not the commission decides to grant new acreage to new companies in the near future, Libya can boast of being the fastest-growing oil country in the world. It will never rank with the Middle East as an oil producer, but it's going to produce a lot of oil and do it more quickly than any major producing country in history.

There's More Than One Way to Import Crude

IN A COMPLICATED arrangement, Mexican oil that might have gone to Cuba is being shipped into the United States.

Apparently there's no conflict with American import laws, but government oil officials are keeping an eye on the deal.

Here's how the roundabout system works:

Asphaltic crude is tankered by Petroleos Mexicanos to Brownsville, Tex., where it goes into bonded storage. Next it is trucked across the border to Pemex in Matamoros and sold to Western Natural Gas Co., a Houston firm. Then duty is paid and the crude is trucked back across the Rio Grande and placed in free storage at Brownsville.

According to industry sources, Western Natural provides about 6,000 bbl. daily to Cities Service, which tankers the crude out of Texas. Western Natural's Brownsville plant gets the other 4,000 bbl.

Washington officials say the arrangement doesn't break import-program rules because overland shipments into the U. S. are exempt from the program's controls.

Privately, they tend to approve of the arrangement. But they say that if the flow increases, a second look will be taken.

If there is any indication that the arrangement is simply a ruse to enable Pemex to buy cheaper crude in Venezuela or elsewhere while selling Mexican crude to U. S. firms, this country's government would no doubt move against the practice.

A Washington official said the U. S. is not permitting the imports just to keep Mexico from selling to Cuba.

At one time, Pemex had been selling more than 40,000 bbl. of residual fuel and asphalt daily to American firms. When these companies quit buying, Mexico started looking for other outlets because it had a surplus of such products.

FAA Would Bind Drillers in More Red Tape

THE OIL INDUSTRY got involved in a Washington hearing over the height of radio antennas last week.

It's an important question because antennas often are attached to drilling derricks. At stake is a lot of extra paperwork.

The problem cropped up when the Federal Aviation Agency sought to enter an area which has been under the Federal Communications Commission. In granting radio-use licenses, the FCC generally hasn't required permits for any structures 170 ft. high or less.

FAA's proposal would require its blessing on antennas reaching above 150 ft. Few drilling derricks exceed 170 ft., so few special permits have been needed. But quite a number of derricks rise higher than 150 ft.—particularly those used in deep drilling.

So, if the FAA got the rules changed, many companies would have to apply for permits that aren't needed now. And they would have to deal with two agencies instead of one.

Because drilling rigs are moved several times a year, filing these applications—and waiting for action on them—could become a problem.

Still another notice to the FAA would be required when, during erection, the structure reached the minimum height.

What makes all this paperwork appear unnecessary is the fact that while permit applications would be needed for structures over 150 ft., the FAA specifies that it would approve any antenna no higher than 170 ft. Thus the only real change would be in paperwork—there'd be more of it.

An oil-industry spokesman told the FAA hearing last week that no one quarrels with rules aimed at improving air safety.

But E. H. Wilder, chairman of the API's central committee on communications facilities, said the industry does object to red-tape procedures which apparently have little or nothing to do with such improvements.

And he noted that the underlying issue seems to be a conflict over which agency should control antenna permits. He said the committee favors the FCC.

FPC Asks New Gas Laws, Defends Its Record

- Commission tells Congress it has been trying hard to clear away some of the brambles around gas regulation, but legislative help is needed badly.

THE Federal Power Commission, under fresh attack recently, presented its own version last week of what has been done and what needs to be done in regulating natural gas.

In its annual report to Congress, the FPC spelled out recent steps it has taken to improve its efficiency and presented recommendations for legislative action which it feels would help it do a better job.

Perhaps with its critics in mind, the commission pointed out that "there are no easy short-cuts in the regulatory field, with its constitutional requirement of 'due process'."

Recommendations . . . The FPC proposals for legislative action were largely the same as those made in past years.

By repeating them, the FPC was making this implication: If Congress had acted on the recommendations, the current backlog of cases might not be so heavy.

Among other proposals affecting natural-gas producers and pipeline companies, the FPC recommended that:

. . . Area pricing should be specifically authorized by Congress.

. . . Commodity value, rather than a utility-type cost approach to producer rate control, should be specified by Congress.

. . . Delegation of authority by the commission to a single commissioner or staff member should be authorized. This, FPC feels, would free the commissioners from a great deal of routine so they would have more time to devote to broad policy.

The commission also asked for jurisdiction over sales of natural gas by pipeline companies for resale for industrial use only.

Commenting on the issue of "locked-in" rate hikes, FPC said it had opposed legislation which would prohibit any rate hike from being made effective while an earlier one was still under suspension. Such a law, the FPC said, would result in more confusion than relief.

However, the FPC did suggest that Congress consider limiting such a "layered" increase to the actual increase in cost of operation.

Progress at FPC . . . The commissioners, in their report, emphasized that they have been making some headway in speeding up their handling of cases.

. . . Rule revisions, made last January, were aimed at shortening hearing time and records by narrowing down proceedings to key issues.

. . . An interim order plan is now being used, in which rate cases are divided by issues so that those issues not requiring extensive field work can be disposed of without waiting for settlement of all points of the case.

. . . Pre-hearing conferences are being used more and more, aimed at trying to work out settlements without the necessity of full-scale hearings.

To emphasize the size of the problems they are struggling with, the FPC pointed out that during the 1960 fiscal year the commission received almost 40,000 filings of all types, and that it issued more than 3,300 formal documents.

By contrast, in the 1954 fiscal year (just before the Supreme

Court's Phillips case ruling) the commission received only 13,200 filings and issued 1,600 documents.

Outlook . . . The FPC proposals, having been largely ignored in the past, are not likely to make much headway in Congress on their own time.

However, congressional consideration of any proposed overhaul of regulatory agencies may cause the FPC views to get more attention.

IRS Outlines Rules

. . . on the combining of properties in units.

INTERNAL REVENUE Service last week published final provisions under which an oil operator has an option of aggregating properties in an operating unit or treating them separately for purposes of applying percentage depletion.

The IRS rules provide that such a choice must be made no later than May 1 of this year.

Once a choice is made, it cannot be changed. However, when a new interest is developed or acquired in a unit already aggregated, the operator can decide whether to include that in the aggregation or to keep it separate. There cannot be more than one aggregation in a given unit.

If no election is made by May 1, the IRS will assume that the operator will be treated as he was under the 1939 Code — basically on a lease-by-lease basis.

One advantage of the current ruling is that an operator can apply the option on all open tax years back to 1954.

That is, he will be able to determine from his records whether he would gain by aggregating all or some of his interests in a given unit or whether it would be better to treat each of them separately.

The choice is tougher, however, on the possible effect in the years ahead. If an operator chooses now to aggregate, he may realize a few years from now that he would have been better off on a parcel-by-parcel basis.

The text of the new IRS rule was published in the January 10 issue of the Federal Register.

watching WASHINGTON

Clyde La Motte

- **Reading between the lines of the Landis report . . .**

BROAD OUTLINES of the incoming administration's plans for natural-gas regulation are emerging.

To "protect" consumers, pressure would be applied to keep prices of large producers down.

Smaller producers would be exempt from direct Federal Power Commission control.

Note how James M. Landis, Kennedy's top adviser on regulatory agencies, sets the stage for this approach in his recent report.

He puts heavy emphasis on consumer protection, chastising the FPC for letting natural-gas prices climb so rapidly in recent years.

But, seemingly aware that the current logjam will continue if every producer case has to go through a formal, drawn-out FPC hearing, Landis adopts an earlier proposal by Sen. Paul Douglas to exempt the smaller producers from such control.

Landis points out that most of the thousands of cases now before the FPC could be disposed of almost immediately if smaller producers were exempt.

This would enable the FPC to concentrate on the big cases. And Landis obviously favors the utility-type cost-of-service approach, because he lambasts the commission for its "refusal" to follow Supreme Court instructions outlined in the court's Detroit case decision.

- **Landis plan may gain support from many groups . . .**

DON'T UNDERESTIMATE the political appeal this plan has for both Congress and the general public.

Many congressmen are aware that the present regulatory approach isn't working. Yet they would hesitate to vote for outright decontrol, fearing charges that they were leaving consumers open to price gouging.

Advocates of this approach also hope to gain support from distributing firms, local regulatory commissions and others—even interstate pipelines. The reason for this hope: Prices would not soar if the big producers were kept under strict control, and there would be less delay in getting cases settled because there would be fewer cases.

Smaller producers would be attracted by the exemptions open to them.

- **No alternate proposals are being advocated yet . . .**

ANY MOVE by the administration to adopt such a regulatory policy will be aided by the fact that no strong counter proposal has been presented to vie with it.

Note that meetings of an intra-industry group to draft gas-legislation proposals have not yet produced any visible results. This gives the Landis-plan advocates a head start.

Note, too, that neither the industry nor the FPC has voiced any public challenge of the Landis report.

This does not mean that the plan, if pressed by the administration, will go unopposed. The FPC, for instance, is smarting under Landis' criticism and would like to fire back in defense. But it will not do so openly, at least not now.

Meanwhile, Landis has gotten widespread publicity, appearing in the role of a staunch defender of the consumer. Congress will be aware of that when it gets around to taking a look at gas-legislation proposals.

New Attacks on Knock-Testing Problem

ONE OF today's most cherished research goals is a laboratory knock-testing method that will accurately predict a motor fuel's performance on the road.

Because of changes in fuel components and differences in the modern car's engineering, the nearly 30-year-old Motor and Research methods now in use give a less accurate index of a gasoline's anti-knock quality.

Yet octane numbers are the basis on which prices are posted and gasoline is bought by the motorist.

Currently, labs have no engine equipment which reliably measures the quality of various gasolines in any auto at any speed. A small test-engine error on the high side can jeopardize the competitive position of a refiner. An error in the opposite direction may cost him millions of dollars annually.

Progress in new knock-testing methods and equipment was the subject of several papers at the Society of Automotive Engineers meeting in Detroit last week. Two promising developments:

... **Adaptation** of the ASTM-CFR engine, including a "high-speed" crankcase and an improved knock indicator.

... **A new "knock-count" technique,** said to be more realistic than present methods for high-octane, aromatic-type fuels. It is based on a knock-detection system which uses a better pick-up to sense cylinder pressure and has electronic circuits tuned to the frequency of the pressure disturbances accompanying the knock.

Favorable experience with the modified ASTM-CFR engine gave Earl Bartholomew, Ethyl Corp., hope that a single engine can be adapted to rate all types of fuels at both low and high speeds.

In low-speed, full-throttle tests of 35 fuels of widely different composition, the average of the ratings in the experimental engine was 0.5 octane unit higher than the average in the car engine.

Operating the experimental test engine at speeds considerably above the normal 600 rpm. was the only way Ethyl could obtain a reasonable correlation. When run at 2,400 rpm. and under conditions tougher than a car engine meets at 3,500 rpm., lab ratings on the 35 fuels averaged 1.8 octane units below those in the car engine. The 600 rpm. speed gave ratings above those for the car engine.

Some of the difference between ratings by Research and Motor methods and those obtained by the experimental single-cylinder engine may be due to deviation of the response of the conventional knock-meter from that of the human ear, Bartholomew said.

Knock-count method . . . R. A. Hoffman, research engineer in Du Pont Co.'s petroleum laboratory, said the "knock-count" rating method measures only those pressure variations caused by gasoline knock. It filters out false signals from extra-rapid combustion.

With the new detection system, it was found the occurrence of knock can be handled statistically. This led to an octane-rating method based on the percentage of engine cycles in which knock occurs.

Results of tests with a number of fuels of varying hydrocarbon types and knock resistance, using a single-cylinder engine at standard knock-rating conditions, showed the new instrumentation gives:

... **Octane ratings based** upon knock. They are not affected by the unusually high rates of pressure rise which, in the case of some fuels, accompany non-knocking combustion.

... **Repeatability** (same ratings by a single engine) is largely independent of octane level, with successive tests giving virtually identical results for any given fuel.

... **Sensitivity** of the new system is the same for all octane levels.

Based on conventional reference

Court Ruling Near on Use of Trespass Law to

THE Texas Supreme Court will decide soon whether the laws of trespass can be used to block an oil or gas-well fracturing operation if any fractures are likely to cross lease lines.

The court recently heard arguments in a confused legal battle over the issue. Earlier, two appeals courts had disagreed on whether the courts or the Texas Railroad Commission have jurisdiction.

The supreme court will resolve the matter.

Contestants in the consolidated proceeding are Delhi-Taylor Oil Corp. and Mayfair Minerals, Inc., on the one hand, and A. W. Gregg and Christian R. Holmes et al. on the other.

The wells causing the fuss were drilled by Gregg and Holmes on tiny townlot tracts in the city of Pharr, which lies over the prolific Pharr-McAllen gas field in South Texas.

Delhi-Taylor and Mayfair Minerals went to court to prevent fracturing of the wells. They contended such fractures would extend onto their adjoining leases, drain gas, and constitute trespass.

In one case, a district court in Hidalgo County granted the injunction but was overruled by the San Antonio Court of Civil Appeals.

In two others, a district court in Hays County refused an injunction on grounds that the Railroad Commission had jurisdiction. The Hays court was reversed by an appeals court in Austin.

Delhi argued before the supreme court that fracturing of "wells only 10 ft., 15 ft., and 37 ft. from its leases would be trespass just as surely as if the wells were drilled directionally to bottom under the Delhi leases." Fracturing, it said, is the same thing as drilling a well bore except that the fracture is

Show Promise

fuel systems, Hoffman said, octane numbers obtained by the new method are considerably higher for aromatic fuels, somewhat higher for olefins, and about the same for paraffins when compared to standard ASTM octane numbers.

The new technique takes much longer than a rating by the standard methods.

Air-fuel ratio control . . . Another research paper by D. Frazier and H. F. Hostetler of Standard Oil Co. (Ohio), discussed the importance of a minimal "fix" for fuels with octane ratings above 100.

Studies have shown that fuels containing large amounts of aromatics can give false Research (F-1) octane ratings. This is because their normal combustion rate in rich mixtures is so high that it affects the knockmeter like conventional "detonation."

The problem can be reduced if fuels are never rated at mixture strengths richer than the one at which the bracketing primary reference fuels give their maximum knock, the authors found.

Any effects of road "interest" thus would be excluded, since conventional cars seem to rate fuels at mixture strengths leaner than that at which primary reference fuels give their maximum knock.

Halt Fracturing

smaller in the latter operation.

The Railroad Commission, Delhi said, has taken no jurisdiction over fracturing because it has never adopted a field rule dealing with it.

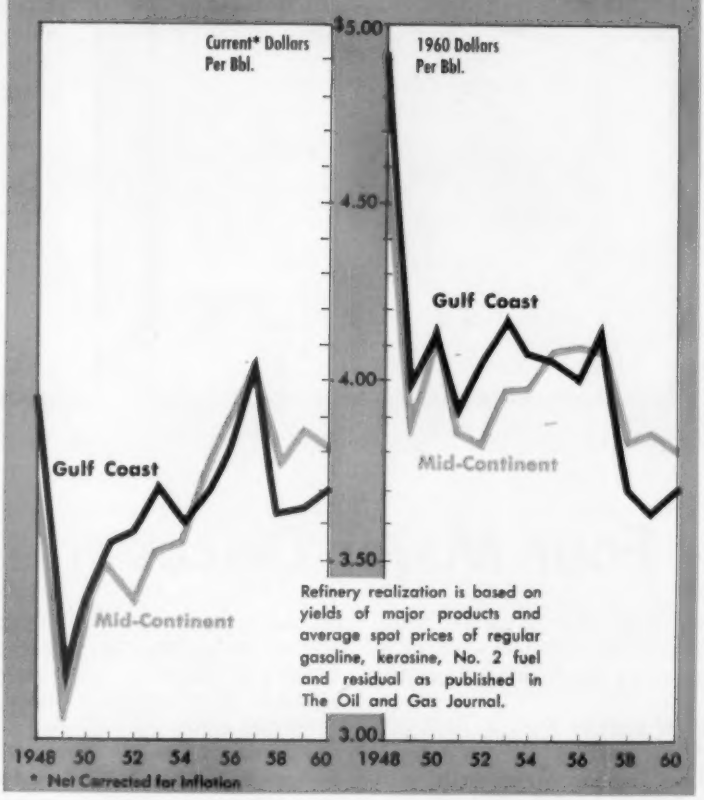
James P. Hart, attorney for Gregg and Holmes, argued that Delhi could not legally take court action until it had exhausted all possible procedures in the Railroad Commission. Delhi-Taylor, he said, had not done this.

Hart contended the commission does have jurisdiction over the process because "fracturing is a process for additional recovery" and the commission deals with the latter.

Inflation Cuts Refiners' Realization

ON A CURRENT BASIS dollar yield from a barrel of crude looks good but . . .

ADJUSTED FOR INFLATION, the realization picture changes sharply.


Current* Dollars Per Bbl.
1960 Dollars Per Bbl.
$5.00
4.50
4.00
3.50
3.00
Gulf Coast
Mid-Continent
Gulf Coast
Mid-Continent
Refinery realization is based on yields of major products and average spot prices of regular gasoline, kerosine, No. 2 fuel and residual as published in The Oil and Gas Journal.
1948 50 52 54 56 58 60
1948 50 52 54 56 58 60
* Not Corrected for Inflation

Group III Ahead of Gulf Coast

TWO TRENDS are clearly noticeable in refiners' realization:

. . . Mid-Continent (Group III) Refiners are doing better than their colleagues on the Gulf Coast.

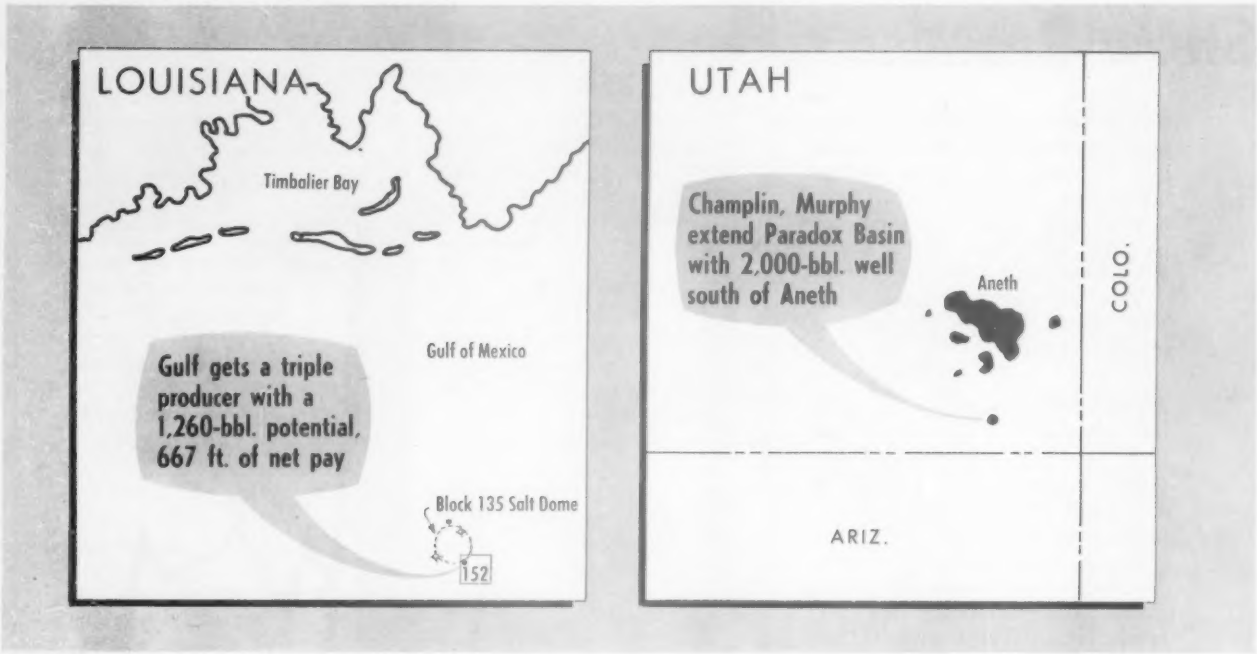
. . . Current realizations look good, but actually they are the lowest in 12 years when corrected for inflation.

The charts depict both of these situations in tracing realizations over the last 12 years.

Since 1958, Mid-Continent refiners have had a greater realization than Gulf Coast refiners. A barrel of products has averaged $3.76 in the Mid-Continent compared to $3.65 on the coast. The spread widened—$3.84 to $3.66—in 1959, and then contracted last year. Mid-Continent realizations slipped to $3.80 in 1960 while those on the coast gained for the third straight year to $3.71.

The more profitable position of Mid-Continent refiners first shows in 1955. It has been maintained with the exception of 1957 when the Suez crisis improved realizations on the Gulf Coast.

Even after adjustment for inflation, Mid-Continent realizations have exceeded those on the Gulf Coast since 1958. An interesting point in Gulf Coast returns: 1953 was better than the Suez crisis year of 1957 because there was less inflation.



Four Major Discoveries Get 1961 off to

SIGNIFICANT oil strikes from Canada to the Gulf last week gave explorers an excellent start on the new year.

In the Gulf of Mexico, Gulf Oil Corp. got its best well yet around the huge Block 135 salt dome.

In Utah, Champlin and Murphy brought in an important well in the wide-open area south of Aneth to extend production in the Paradox basin.

In South Texas, Superior found Deep Edwards oil in Gonzales County, in the middle of a 50-mile gap between existing Deep Edwards trend production.

And in Alberta, Shell brought in a big oil well in Waterton Park field—Canada's biggest reserve of natural gas.

Here are details on these important new discoveries:

In the Gulf:

MAJOR production finally appears near on one of the Gulf Coast's largest known salt domes after nearly 5 years of steady drilling with mediocre results.

Gulf Oil Corp.'s E-1 OCS-0464 well, drilling on the south flank of the dome, turned up these results: 667 ft. of net pay, 16 productive sands, well completed as a triple oil producer with potential flow of 1,260 bbl. daily.

The new discovery moves production more than 3,000 ft. southwest from partly developed oil production on the southeast flank. It is more than 4 miles across the top of the dome from first producing area on the north flank.

The Block 135 field actually touches four blocks some 30 miles south of Timbalier Bay. Drilling has been carried on since 1954 with production so far proved on far north, southwest, and southeast flanks.

A total of 23 holes have been drilled from five platforms. Platform A, the first, drilled nine holes on the north flank and got four oil wells. Platform B put down three holes on southwest flank and got one producer. Platform C, drilling on the northeast, drew three dry holes. Platform D drilled seven straight oil wells on the southeast, turning up nine pay sands; and then Platform E turned up the latest very promising discovery on the same flank.

Development of the dome is a joint operation of Gulf and Humble.

In Utah:

A 2,000-bbl.-daily oil producer will turn the southeastern Utah portion of Paradox basin into another hot area.

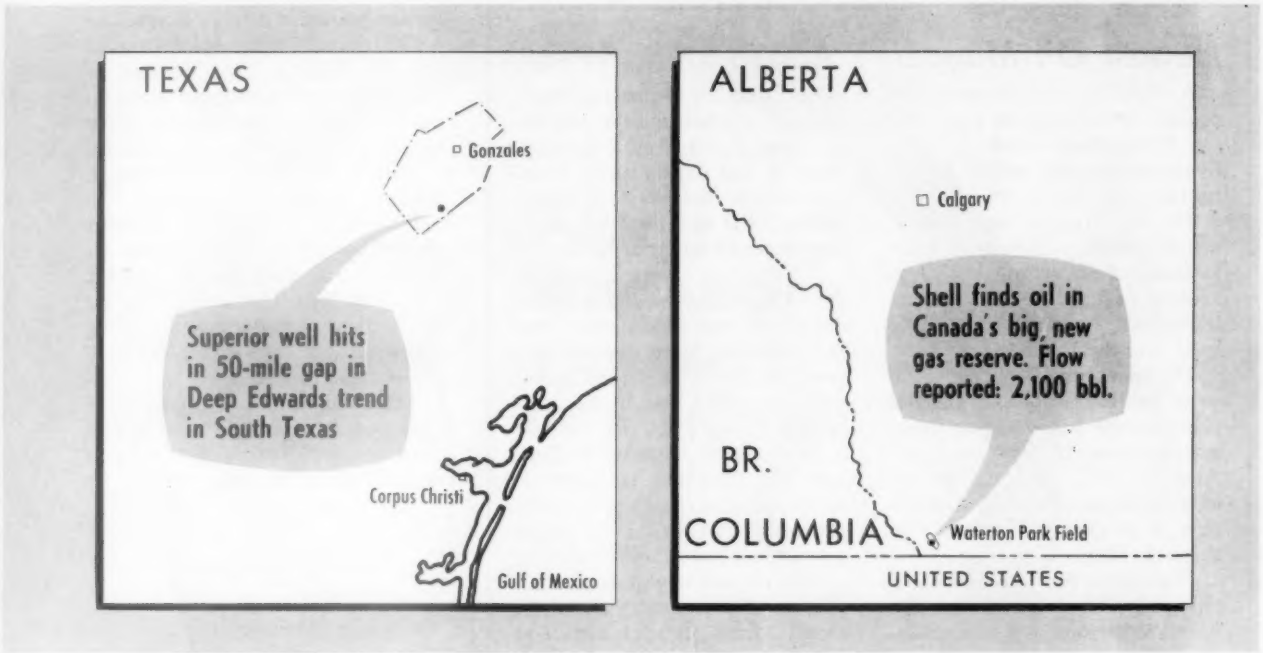
Champlin Oil & Refining Co. and Murphy Corp. completed the 1 Navajo-111 in Section 13-43s-24e, San Juan County, flowing 2,085 bbl. daily from perforations at 5,304-26 and 5,338-46 ft. in Pennsylvanian.

Exploration people call the well the most significant oil find and the most important Pennsylvanian discovery in the basin since Aneth field was discovered in 1956.

The well is 8 miles south of White Mesa field, 15 miles south of Aneth, and just 4 miles north of the Arizona line. Nearest Arizona production is 8 miles south.

This is Champlin's first producer in Utah. It lies on a block of 1,280 acres jointly owned with Murphy.

The only discovery in this corner of the basin last year was Texaco 1 Navajo "U," NCT in Section 32-40s-26e. It pumped 14 bbl. of oil per day and 17 bbl. salt water from



a Good Start

perforations in the Ismay at 5,420-60 ft.

The Paradox basin was an oil unknown until Aneth, but production actually was established there in 1908 at Mexican Hat. That old timer also produced from Pennsylvanian. Now there are 21 fields producing oil and gas in the basin, all but two opened since the Aneth discovery.

In South Texas:

A SIGNIFICANT oil discovery by Superior Oil Co. in the southern part of South Texas' Gonzales County forges another link in the chain of fields producing from the potentially rich Deep Edwards formation.

It is the first production from the Deep Edwards horizon in Gonzales County. The well is in the middle of a 50-mile gap that has separated an isolated Deep Edwards discovery well farther up the coast in Lavaca County from the previous most northeasterly field on the trend.

The new discovery well, 1 Georgia Dubose, produces from a zone perforated at 12,330-50 ft. On a 5-hour gage through 9/64-in. choke, it flowed at the rate of 156 bbl. daily plus 16½ bbl. of water. Gas-oil ratio was 513 cu. ft. per barrel and pressure 840 psi. Gravity of the oil was 33.6°.

Good gas production was indicated in earlier open-hole formation tests taken in the pay from higher up the section. Since testing, the oil zone has been squeeze-cemented to shut off water for retesting.

Nearest Deep Edwards production on the trend to the southwest is 20 miles in the large, developing Person field, in Karnes County. The lone northeast extension of the trend, at Word in Lavaca County, is more than 30 miles distant.

Superior's well also is only a few miles north of the DeWitt County line near the center of an area where the nearest production of any kind is more than 10 miles distant.

It is more than 20 miles toward the coast at this point from the shallower Edwards trend of fields along the Balcones and Luling fault zones. It also is about the same distance inland from the nearest coastal fields.

In Alberta:

SHELL Oil Co. of Canada, Ltd., has found crude oil on the west flank of the giant Waterton Park gas field in southwestern Alberta, 125 miles southwest of Calgary.

It is the second crude discovery for Shell in the general district but is more prolific than the first and probably will spark new development in the region.

The discovery is the Shell 7-5-4-1 (12) Waterton. It found the Mississippian horizon around 12,270 ft. but was taken down to 13,001 ft. The open-hole interval from 12,420 to 12,950 ft. was acidized with 6,000 gal. Initial production tests indicated a gas flow of 6,000 M.c.f. daily and 2,100 bbl. of crude oil.

If the well turns out a major oil producer, it may prove a problem for Shell. The company's gas reserves in Waterton field have been committed for delivery to California.

If the gas is pressuring the oil column, particularly in the second fault area on the western side of the field, conservation authorities could curtail production from four gas wells in that thrust sheet.

The discovery, however, could provide a much needed exploration spark for this part of the province. If a major reserve actually is proved, it would be only the second oil field in the Foothills area and the first since Turner Valley in 1936. Like Waterton pool, Turner Valley field once was considered only a wet-gas region.

Newest Oil Magazine Appears This Week

A MAGAZINE designed especially for oil men of the Eastern Hemisphere — Oil and Gas International—will make its appearance this week.

The first regular issue will be mailed within a few days from Holland, where the monthly magazine is being printed, to readers throughout Europe, the Middle East, and the Far East.

The new oil magazine is a sister publication of The Oil and Gas Journal and Petroleo Interamericano—which serves Latin America. It is designed for oil men in technical and managerial jobs in all countries outside the Western Hemisphere.

Decision to start publication of Oil and Gas International followed more than a year of intensive research into the editorial needs of oil men throughout the world. Because business communication is less extensive and the interchange of technical developments is less free in many countries outside the Western Hemisphere, OGI is expected to fill a long-standing editorial need.

It will serve a vast area which produces nearly two-thirds of the world's oil and which every year has become more active and more important in the oil industry's economics and in its technology.

OGI will be published in English—the dominant language of the oil industry everywhere—with expanded abstracts of major articles in German and French.

The magazine will be staffed abroad. Operations will be directed from headquarters in London and from offices in Paris and Dusseldorf.

Tankers Ride Business Surge

• Continued demand for heating oil pushes rates up, but operators still expect some rough sailing.

TANKER OPERATORS are enjoying a spurt of brisker business and rates are stronger than they were a year ago. Brightest spot is in U. S. coastal traffic.

Early January's cold kept in force the heavy demand for heating oil which started last month. Rates have climbed to the American Tanker Rate Schedule plus 30%.

However, operators don't expect good rates to return for a sustained period within the next 3 years or more.

The current picture contrasts sharply with the scene a year ago. The 1959-60 winter season began with a normal cold-weather rise in rates. December 1959 rates for a T-2 in coastwise dirty traffic, U. S. Gulf to north of Hatteras, started at ATRS minus 20%. In 2 weeks they climbed to plus 5.

But the weather broke and at mid-January last year, charters were fixed at minus 20%. In February, the figure was minus 30.

Since the first of this year, T-2's have been chartered at up to plus 30 or even 35, and a supertanker has gone for the flat ATRS rate.

Sudden mild weather could send the market tumbling, but the tonnage situation is tighter—at least temporarily—and the drop might not be as steep as in some past years.

Here are some of the things holding down the availability of American tonnage:

Regulations give half of all foreign-aid shipments to U. S. vessels; ships in tie-up can't come back into the market without expensive overhauls; and conversions to grain service have removed a number of ships from competition.

The coastal market also has benefited from recent rises in foreign rates.

However, an example will prove how a show of strength can be beaten down.

Last month's residual fuel oil quotas buoyed foreign rates to ATRS minus 7½% as of December 19. Then a large amount of tonnage came out of tie-up, depressing the market, and charters have been made at ATRS minus 52½%.

Another threat lies in the foreign market's surplus of tonnage.

Brokers say increased Russian chartering has had little if any effect on the market. But the market has controlled Russia's ability to get needed tonnage for expanding exports, especially for the Black Sea-Havana run.

Yet when demand for tonnage is brisk—as it was last month—ship owners spurn Russian offers in favor of other business.

Synthetic rubber output, use set records in 1960

SEVERAL production and consumption records were set last year by the U. S. synthetic-rubber industry, and 1961 should be as good or better.

The new marks, according to the Rubber Manufacturers Association:

. . . **U. S. production** of synthetic rubber: 1,450,000 long tons compared with 1,379,652 in 1959.

. . . **U. S. consumption** of synthetic rubber: 1,077,000 long tons compared with 1,072,726.

. . . **U. S. exports** of synthetic rubber: 350,000 long tons compared with 290,000.

. . . **Ratio of synthetic to total** new-rubber use: 69% compared with 65.9%.

Forecasters expect consumption of synthetic rubber to total 1,150,000 long tons this year.

High natural-rubber prices are stimulating the growth of new lower-cost synthetic rubbers. Leaders among substitutes include polyisoprene, a complete substitute for natural rubber, and polybutadiene, a partial substitute.

The association looks for the U. S. capacity of these "stereo" rubbers, which went into commercial production in 1960, to increase from 5,000 long tons in 1960 to 375,000 by 1965. Free foreign capacity is forecast at 180,000 long tons by the end of this period.

ATLAS PIPE INC.

A DIVISION OF ATLAS BRADFORD COMPANY

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Spaght Says Company That Diversifies

• Shell president sees plenty of chances for oil growth but warns there's no future for those in a rut.

Gene T. Kinney
East Coast Editor

THE FUTURE belongs to the company which is willing to live by its wits and not tie itself too rigidly to petroleum alone.

This concept, says Monroe E. Spaght, new president of Shell Oil Co., is the way to escape the growth straight jacket of a business dominated by a single raw material, however versatile.

"If we embrace this concept," he says, "then the new activities of a company would be anything and all things that our talent and brainpower allow it to do. We must learn to live by our wits."

Otherwise, growth might resemble that expectable in casket-making.

Criteria for growth . . . Spaght believes petroleum is far from finished as a growth industry.

Certain economists outside the industry have interpreted recent excess-capacity troubles as an end to the era of dynamic expansion. To these analyses the new Shell president counters: "What are the essential characteristics of a growth industry? We presume:

. . . "Consumption of present products will increase.

. . . "New products will be developed from its present raw materials.

"Petroleum certainly satisfies both of these requirements."

On the first point, he acknowledges the U. S. will not increase its consumption of conventional petroleum products at the high annual rate of post-World War II years.

We have been forging ahead on the crest of a growth wave pushed by rising per-capita energy consumption, a steady increase in oil's share of the energy market, and an increasing population as well. Henceforth we may have to depend primarily on population growth.

For some products, Spaght expects consumption to grow faster than population. Aviation fuels should follow this pattern. So will certain specialties such as some volume chemicals derived from present oil materials.

"But, as to efforts to increase demand through new uses for existing products, I think they will have a relatively small effect compared with our big basic load," he says. "I'm afraid this is one of the facts of life—that the U. S. is a rather mature consumer of oil products."

On the second point, Spaght continues, many new products such as chemicals certainly can and will be made with oil as one of the starting ingredients.

"Among oil companies in the U. S., Shell is the biggest in this area. And we intend to grow as vigorously as we know how. Chemicals may not be large-volume products compared with motor gasoline. But they give us an opportunity to invest our brainpower and talents. And the money that can be made as a result can be very important."

A new growth area . . . Spaght suggests a third area of growth for a company:

"I think it is dangerous for any company to be too rigid in considering what its function in society is. If Shell considered that its only avenue for activity was producing, refining and selling primary petroleum products, then some day, sooner or later, we would be doomed to die.

"Therefore, the activity of any company should be dictated by its talents and brainpower rather than be tied rigidly to a particular raw material.

"To any group that is vigorous and ingenious in research," he says, "opportunities (for new areas of business activity) will come in a never-ending stream. Embracing them is as much a characteristic of growth as is a constantly increasing demand for an existing product."

Lessons from history . . . The industry that ties itself too specifically to one product, Spaght cautions, will eventually find that the world passes it by.

History is full of such examples and is also replete with success stories of companies whose conception of their functions was broader, more flexible, more fundamental. For instance:

"Some of the big names in the automotive industry today originally made carriages and wagons. Then the automobile came along. They could have let the world move away from them. But they decided that they were not strictly carriage and wagon makers, but more basically makers of conveyances in which people sat and were transported. Hence the transition under this philosophy became obvious and, as the intervening years have proved, very profitable.

"Look also at a typical American organic chemical company. It does not rely on its vested position in any particular raw material. It probably has no reserves of oil and gas, no timber, no coal mines, no cotton fields. Yet it may use all of these. It lives by its wits, by its brainpower. No one could deny that it is a growth company."

The test for growth . . . The oil company that succeeds best in the future, Spaght predicts, will be the one that recognizes these lessons.

"If you have a company that is making everything from petroleum that it profitably can; if it then incorporates with this a vigorous research effort and a management that knows what to do with new knowledge, then you have a growth company."

He cites Shell Chemical Co. as an example of a business with an open mind to new opportunities.

"Starting as a business based on oil, it is now one that is living more and more by its wits. Shell Chemical, in appraising possible new products, is little influenced by whether the raw materials are petroleum derivatives. Oil is a very eligible chemical raw material with which to make other things, but it is very often just one of the many ingredients in a new product."

With the increasing complexity of

For more on Spaght, see p. 130.

Will Win Out

technology, how can management overcome the communications barrier and recognize opportunities opened up by research?

"Management," Spaght feels, "should have no trouble effecting a wedding of research and business. It is one of the jobs of modern management to see that such trouble doesn't exist.

"If I were appraising a company's prospects, I would be sure to look first at the character of its management. I would perhaps be as interested in whether it was alert in seeking out new knowledge and putting it to work as in the outlook for its raw materials."

Putting knowledge to work . . . Spaght's clear exposition of his philosophy makes pioneering enterprise sound easy and day-to-day operations humdrum. But he intends neither.

"I do not mean to imply that developing new products and exploiting new fields is simple," he says. "These things do not spring full blown. Shell's chemical business has been in existence for 32 years.

"Between the statement of these principles and the realization of a profit from their implementation lie years of hard investment, of soul-searching commitments in research and development and risk taking. There are a lot of sleepless nights connected with a growth industry. But there would be no sport in a static industry.

"So far as the problems with which our industry is now preoccupied are concerned, of course we must be efficient; we owe it to our companies and to society. We must be vigorous and highly cost conscious in all operations. This is a part of everyday housekeeping. But in addition there is the basic job of getting more knowledge and putting it to work."

INDUSTRY GROWTH requires open minds, says Shell President Monroe E. Spaght.

INDUSTRY BRIEFS . . .

A Texas appeals court's refusal to reconsider its ruling that the state's severance-beneficiary tax on gas is unconstitutional paves the way for an expected appeal by the state to the Texas Supreme Court.

A huge LPG storage facility is planned by Humble in the Barbers Hill field of Chambers County, Texas. Railroad Commission approval is being sought for a 250,000-bbl. cavity in the Barbers Hill salt dome which would be used to store ethylene.

A one-third interest in 935 leases totaling 637,500 acres has been bought by Western Development Co. of Delaware from Penn-Ohio Gas Co. The leases are in Wyoming, Colorado, Montana, Utah, and New Mexico. Western will pay $621,000, half now and the rest September 1. Western has signed an agreement with Hiawatha Oil & Gas Co. and Benedum-Trees Oil Co. to operate the properties. The leases are undeveloped, but roughly a dozen wildcats are now drilling.

A $10-million exploration and development program is slated by Trice Production Co., Longview, Tex., during 1961. This will boost to $60 million the money spent for drilling operations since the company was formed in 1955. Trice has chalked up 325 producers out of 600 wells drilled.

In a $1-million cash transaction, Dallas independent Sam Boren has sold his holdings in Boren field, Young County, Texas, to a group headed by Charles E. Ledford, Winchester, Ky. Production includes 35 wells on 500 acres of leases.

Sale of 19 oil wells in West Texas' Levelland field has been announced by Western Drilling Co., Inc., Lubbock. Stanton Oil Co., Ltd., San Antonio, bought the wells for an undisclosed amount. All are on the Sunray - Wright lease in Cochran County.

Texas Small-Tract Drilling Ban Likely

• **Pressure for such a move is growing, and it's a good bet that the state legislature will dig into the matter soon. The lawmakers also may take up proposals for oil-tax hikes, a basic-spacing law, and other major issues.**

DRILLING on tiny tracts may be outlawed in Texas this year.

The fifty-seventh session of the Texas Legislature, which convened last week, is almost sure to tackle this issue. And odds on passage of a bill are better than ever.

Numerous gas wells have been completed in the past couple of years on townlot leases less than 1 acre in size and barely large enough to accommodate a rig. This has heightened criticism of the Railroad Commission's Rule 37 exception to spacing rules.

More and more independent operators are joining major companies in efforts to ban the practice.

Perhaps a sign of the times was a special meeting of the unitization and executive committees of the Texas Independent Producers and Royalty Owners Association — a steadfast opponent of unitization in any form.

The purpose of the January 12 meeting in Wichita Falls: "To consider possible modification of TIPRO's policy on compulsory unitization, forced pooling for drilling units, and wider spacing."

Some other Texas producer associations officially frown on tiny-tract drilling. And an endorsement by TIPRO, with its 6,500 members, of legislation banning the practice would go far toward assurance of passage.

Most Texas operators are convinced that legislation is the only way to put an end to drilling on pint-sized tracts. The Railroad Commission maintains that present law forces it to permit a well to be drilled on a lease, no matter how small, if the land were subdivided before the discovery of oil or gas.

It has also held fast to its standard allocation formula in fields containing such wells of two-thirds acreage, one-third well for gas. And for oil 50% acreage, 50% well.

The courts have supported commission policy in both instances.

This, opponents contend, gives the small-tract operator a "legal license to steal"—to heavily drain oil and gas reserves from adjoining leases at the expense of both neighboring operators and royalty owners.

Other issues ahead . . . The legislature will be considering along with the small-tract problem, many other measures of great interest.

It's expected that further attempts will be made toward increasing the tax load on the petroleum industry to help meet a current fiscal crisis in Texas. And the legislature is expected to consider important bills calling for compulsory field-wide unitization for secondary recovery, a basic-spacing law (Texas still does not have one), tightening of ratable-take laws, pollution, leasing of state highway right of ways, and other petroleum issues.

Following is a rundown of the more-important oil legislation which probably will be introduced:

. . . Added taxes. Texas is now expected to be about $63,000,000 in the red when its fiscal year ends next August 31.

For the next biennium, the state will need to rake up $80,000,000 to $105,000,000 a year in new revenue to retire the deficit and finance expected appropriations.

Austin sources predict that an effort will be made in the legislature to hike Texas' current 7%-of-value tax on gas production by 2%. Proponents will attempt to make this more palatable to the industry by making the tax temporary — to expire when the state's fiscal problems have been solved.

The industry is expected to stand united against any such increase. And odds are against its passage.

. . . Compulsory unitization. A bill providing for compulsory field-wide unitization, if submitted as predicted by some, is not likely to fare much better than similar bills in previous sessions.

Though most major companies approve, a great many independents and all local producer associations are still opposed.

. . . Basic spacing law. Informed sources predict a bill calling for a basic 40-acre spacing law will be submitted.

High development costs are credited with boosting operator sentiment for such a law in Texas. Many independents, however, still feel it preferable to leave spacing in the hands of the commission rather than put it in the law books. And it is not yet clear whether support is strong enough to push the bill to passage.

. . . Ratable-take push. It is a virtual certainty that independents will again make a strong effort to get legislation tightening the state's ratable-take laws.

They contend that present law still permits common carriers and purchasers to favor their own production. They argue also that common carriers and purchasers have found a way to "buffer" themselves against transporting or buying inde-

PROCESSING

Benzene capacity will be increased from 30 million to 50 million gallons a year at Humble's Baytown, Tex. refinery, and toluene capacity will be upped from 32 million to 55 million gallons. The toluene de-alkylation unit will use a process developed by company researchers. Humble's refinery at Baton Rouge, La., also has a 25-million-gallon-yearly benzene unit.

A new family of 8-carbon compounds is being produced in drum quantities by Cities Service Research & Development Co. Using butadiene as a feed and two new catalysts, Cities Service is making such products as cyclo-octadiene,

pendents' oil by using trucking or gathering firms for "go-betweens."

This, they say, permits the common purchaser to cut off such oil any time it wishes, thus skirting its ratable-take responsibilities.

A bill which would extend ratable take from a "field basis" to a "general area" basis was buried in the last session of the legislature only after a long, bitter, and close intra-industry fight.

It will be close again this year.

. . . Highway leases. Last year the state highway department nearly auctioned mineral rights under state roads traversing producing Texas fields. It was headed off by legislative pressure after much industry screaming.

This year it appears likely that the legislature will specifically ban such leasing by law. The Texas Legislative Council has drawn up a bill to this effect which is certain to be introduced. Odds for passage are good. The council declared that leasing of mineral rights under highway right of ways would result in physical and economic waste.

. . . New pollution laws? Controversies with local water districts in several areas over pollution of freshwater sources by oil operations hold up the possibility that new pollution-control bills may be introduced.

Oil pollution is charged with holding up construction plans for a dam in West Central Texas. Pressure on the legislators is not yet thought sufficient to result in any new laws this year. And operators' efforts to correct the situation themselves, if possible, may ease the pollution issue in the future.

. . . Buy Texas law? Pressure is building from oil and other industries for legislation requiring state agencies to buy Texas products. The Texas Highway Department already has adopted a policy of buying Texas-made asphalt whenever possible. Independent operators would like to see this policy adopted by other state agencies.

Now You Can See Outer-Casing Corrosion

AN INSTRUMENT that draws a picture of oil-well casing corrosion — outside and inside — has been announced by Shell Development Co.

Now licensed for commercial manufacture, the electronic device is designed to "detect the bite of corrosion in time for corrective treatment."

Nipping leaks in the bud can forestall repairs costing as much as $30,000 to $60,000 per leak.

The electronic profile of the casing shows both the depth at which corrosion is occurring and the extent of penetration. Even a pit as tiny as 1/200 in. cannot escape detection.

Shell says the method is the first to reveal external pitting. Existing down-hole instruments measure corrosion by examining only the inside wall.

As the new device is lowered into the hole, electromagnetic waves travel from a sending coil into the casing and back to a

pickup coil. Thickness of a casing wall is gaged by the time required for wave penetration.

The changes in wave travel time are sent to the surface where a pen recorder traces the casing profile.

BRIEFS . . .

cyclo-octene, and cyclo-octane. Limited quantities are going to plastics and chemicals manufacturers for evaluation and development. Possible uses include new types of molded plastics, nylon fabrics, adhesives, coatings, and high-energy airplane fuels.

Record crude charge to a single unit may have been set by Tidewater Oil Co. The company's Delaware City crude-distillation unit handled an average of 159,000 bbl. daily late in December. High rates were part of a plan to bring the plant's December throughput to the budgeted level, following a turnaround aimed at reducing bottle-necks.

An IBM 7070 computer has been installed by Universal Oil Products Co., Des Plaines, Ill., to handle an increasing amount of engineering calculations. The 7070 replaces an IBM 650, which the company says couldn't keep up with demands.

Controlling interest in Petroleum Industries, Inc., Irving, Tex., has been sold by Dr. Joseph Shoaf to A. R. Matthews and Roy Browning of Fort Worth. Shoaf has resigned as president and a director. The company operates a 1,000-bbl. per day refinery at Irving.

A gas-liquids plant with a capacity of 35 million cubic feet will be built by Shell Oil Co. to serve North Rincon and La Copita fields in Starr County, Texas.

Also for Refiners . . .

IN THE NEWS: Mexican crude is coming into the United States in a strange combination of ways (p. 47) . . . New approaches to gasoline knock testing bear promise, SAE meeting is told (p. 50) . . . Inflation is cutting down real gains in refinery realization (p. 51) . . . Good winter demand for heating oil has pushed up tanker rates, but long-term outlook for tankers still is on the dim side (p. 54) . . . New electro-mechanical strain gage gives refiners better control over processing (p. 62) . . . New processing units to go on stream at Petrobras' refinery (p. 66).

Transco Forges Ahead With Pipeline Project

• Shrugging off threats of a rival enterprise, the company nails down its plans for a LPG line across the southern part of the U. S.

TRANSCONTINENTAL Gas Pipe Line Corp. cemented plans last week to build its LPG pipeline through the southern states despite threatened competition of another line.

Transco's subsidiary, Trans-Southern Pipeline Corp., announced the "final design" on the project, changed the routing on the eastern end to a more southerly terminus, changed the line size for some sections, stepped up the number of pump stations, disclosed completion of a second river crossing, and set an August goal for completion of pipe laying.

All the activity may give pause to a group of four LPG producers studying the possibility of constructing a line into the same area (OGJ, Dec. 12, p. 82). The four are Warren Petroleum, Phillips Petroleum, Union Texas Natural Gas, and Tuloma Gas Products.

Trans-Southern's executive vice president, Robert L. Topper, says suppliers are being notified that his company will definitely build the line—and if the other group persists in building one, there will simply be two competing lines.

Most industry sources believe there is insufficient business to support two lines.

"But we have made up our mind," Topper said. "Our line will be built—and it is being built."

New plans . . . Design changes announced by Trans-Southern include the following:

The eastern end of the line will move south of Spartansburg, S. C., to Sanford, N. C., instead of going north of Spartansburg to Charlotte, N. C., and on to Danville, Va. The new routing puts the line closer to the Raleigh, N. C., terminus of the proposed rival line.

The size of the line will be 10-in. from the starting point at Mont Belvieu, Tex., to Atlanta, 8-in. from Atlanta to Anderson, S. C., and then 6-in. to the Sanford terminus. Originally it was to have been 8, 10, and 12-in. from Mont Belvieu to Atlanta, and 8 and 4-in. from Atlanta to Danville.

A spur line from Atlanta to Waycross, Ga., will not be built the first year but is planned for later. Three spurs will be built. They will be to Demopolis, Ala., Hattiesburg, Miss., and to an area south of Baton Rouge.

Twelve pump stations are planned, and land has been acquired for five of them. Underground storage will be built at Jonesboro, Ga.

Work in progress . . . Trans-Southern last week completed an underwater river crossing on the Tallapoosa River in Alabama with a 10-in. line.

An earlier crossing of the Tombigbee River was the first construction on the seven-state line.

Topper said Williams Brothers, Tulsa, has designed and engineered the pump stations and terminals on the line, and pipelaying will be ready to start by April 1. Some seven or eight spreads will be at work in April and more by June.

The line will be laid and ready for testing by August.

Cost of the line will be less than the original $63 million estimate, Topper said, because of the design and route changes.

Underwater Completion Made

. . . off Louisiana. The Shell achievement may provide a break later for deep-water drillers around the world.

SHELL OIL CO. has made a hush-hush underwater completion off Louisiana—the first ever made for a producing well in the world's largest offshore area.

The completion is considered important to the oil industry because Shell's work may provide the key to drilling in the deeper offshore waters of the world.

For competitive reasons, Shell is keeping its technique under wraps.

The wellhead equipment was attached on the seabottom in 55 ft. of water last December 19. The completion is a development well drilled to 8,300 ft. about 35 miles offshore in Block 192 of the West Cameron area.

More than a year ago Shell made its first underwater "completion" off Louisiana, but it was strictly experimental and not a producer. No information was released on the method used.

Shell Development Co. at Houston has been charged with the responsibility for developing the completion technique, while the marine production division of the New Orleans area of Shell Oil Co. acts as operator on the project.

As a major offshore operator, Shell has been particularly active in ocean-bottom-completion experimental work.

The company last February ob-

PIPELINE

An expansion program is scheduled for Mesa Pipeline Co., Midland, Tex. Last year the company built a gathering system to take oil from the Azalea Strawn and Devonia fields in northwestern Midland County. It now plans to extend the Azalea-type operation to other fields in West Texas and southeastern New Mexico.

British Columbia's program for connecting northern gas fields of the province has moved ahead with the completion of three sections of the Gas Trunk Line. One section, 28 miles of 16-in. line, connects Westcoast's Buick Creek feeder with Nig Creek; another, 24 miles of 12-in.

tained four offshore tracts in the deepest water ever leased off Louisiana. The tracts, with water depths of 240 to 360 ft., came at bargain rates of $18 to $40 per acre. They consist of Blocks 109, 110, 116, and 117 in the Grand Island area.

Other oil companies also have been active recently in underwater-completion activity.

Richfield Oil Corp. and Cities Service Co. made a completion in 132 ft. of water off Peru last fall (OGJ, Oct. 3, 1960, p. 65).

Natural Gas to Up Capacity

NATURAL GAS Pipeline Co. of America, now operating all the pipeline facilities of the Peoples Gas Light and Coke Co., Chicago, plans to increase its pipeline capacity in 1961 by 100,000,000 cu. ft. per day.

The boost in capacity, which will be accomplished by adding compressor horsepower, is part of a $25,500,000 expansion program that will be started this year.

As a part of the expansion, Natural Gas Storage Co. will raise deliverability of gas from storage by 75,000,000 cu. ft. Natural Gas takes gas from the Herscher and Cook's Mills underground storage with other utility companies.

Part of the expansion program includes the development of additional underground storage at Mahomet, Ill.

Alberta-California Project Speeded

FIRST PIPE is being lowered into the ground on U. S. portions of the 1,400-mile Alberta-California natural gas pipeline. The installation occurred recently at the Oregon-California border.

In the photograph, workmen make a weld on the first Pacific Gas & Electric Co. section on the California side. Beyond the crowd at the barrier, Pacific Gas Transmission Co. pipe is being lowered into Oregon soil.

The crews are installing 36-in. pipe north and south from the state border and at eight crossings of the Moyie River in northern Idaho. PG&E is building the California section and PGT the section in Oregon, Washington, and Idaho.

BRIEFS . . .

line, goes on to La Prise Creek; the third, 27 miles of 16-in. line, connects Boundary Lake with the Taylor plant.

Increased capacity is being provided for a 6-in. Lone Star Gas Co. system by a new 440-hp. compressor unit 2 miles west of Pottsville in Hamilton County, Tex. The 6-in. line ties into a 10-in. main which ends near Bandera, 140 miles to the southwest.

A fourth main-transmission line from the Hugoton field to markets in eastern Kansas, Illinois, Ohio, and Michigan is proposed by Panhandle Eastern Pipe Line Co. Simultaneously, the firm's subsidiary, Trunkline Gas Co., asked the FPC for permission to make additions to its lines. The combined projects would cost $77 million.

An 82-mile products line from Helena to Great Falls, Mont., has been completed by Yellowstone Pipe Line Co. The 6-in. line, a spur off Yellowstone's main line from Billings to Helena, connects with Conoco's new terminal at Great Falls, where a 3-in. line serves Malmstrom Air Force Base. The new line will distribute products from refineries at Cody, Wyo., Billings, and Laurel, Mont.

Also for Pipeliners . . .

IN THE NEWS: Two pipelines play key role in boosting Libya into fast growing oil area (p. 45) . . . FPC tells Congress what needs to be done to help regulate natural gas (p. 48) . . . Transco goes ahead with plans to build LPG pipeline through southern states (p. 60) . . . Pipe starts going into the ditch on U. S. portion of Alberta-California gas line (p. 61) . . . Contract has been let for plastic underwater gas line to serve Vancouver Island (p. 62).

PLUS THESE TECHNICAL REPORTS: Compressor station gets new intake filters (p. 86) . . . Savings from cathodic protection (p. 93).

New Device Promises Better Process Control

• Electro-mechanical strain gage expected to be more accurate in both measuring and controlling processes.

MORE ACCURATE, trouble-free measurements and control of refining, petrochemical, and other oil-industry operations are expected to result from the development of a new potentiometer measuring system.

Termed an "instrumentation milestone" by its developer, Minneapolis-Honeywell's Brown Instruments Division, it consists of an electro-mechanical strain gage for balancing the measuring circuit against the input signal from the process variable.

The device replaces the conventional slidewire, something long desired by instrumentation engineers.

Using the strain gage as a feedback element—controlling the magnitude and polarity of the feedback voltage of the measuring circuit—makes possible infinite resolution in the potentiometer's output. With slidewires, the number of points at which a potentiometer can come to balance is limited to the turns (convolutions) in the slidewire.

Use of the strain gage also eliminates problems arising from mechanical wear on the contactor and wire, as well as the need for periodic standardization in conventional slidewire instruments.

Other improvements contained for the first time in a basic potentiometer include:

. . . **Isolation** of all critical components within an electrical shield, thus rejecting stray signals that cause recording errors.

. . . **Single reference** junction compensation for all types of thermocouple actuation.

. . . **Transistorized** plug-in control units up to a maximum of eight set points for auxiliary or zone control.

In introducing the new type potentiometers at a New York press conference early this month, Brown Instrument officials said initial models will be limited to single-pen strip and circular-chart recorders and a circular-scale indicator, each with or without control.

Alaskan Gas May Generate Power for Utility

A SECOND gas field may be developing soon in Alaska.

Standard Oil Co. of California is negotiating with an electric utility in Anchorage for the sale of gas to fuel an electric power plant. The gas would come from Swanson River field, which produces the state's only oil.

Only one well in Swanson River has been completed as a gas producer, but Socal says gas zones have been found elsewhere in the area. The one completion (SRU 32-10) is the most northerly well in the field. There are 19 oil wells in the field producing 6,474 bbl. daily.

Socal says 16 cents an M.c.f. has been discussed as a "suggested" price for the gas. The amount of gas involved was not revealed. If the deal is made, a power-generating plant would be built at the field. The gas would fuel the turbines. Coal is the present fuel source of the utility.

Swanson River is one of three gas producing areas in Alaska. All are on the Kenai Peninsula. Union Oil Co. and Ohio Oil Co. have developed a sizeable gas reserve about 20 miles southwest of Swanson River. Gas from this field will be moved to Anchorage for home heating once a pipeline is completed. Union and Ohio have completed four wells in the field and are drilling a fifth.

Halbouty Alaska Oil Co. has a gas discovery about 8 miles south of Swanson River, but has not developed the lease.

Plastic Gas Line to Serve Vancouver Island

CONTRACT has been let for a 53-mile pipeline which would cross the Strait of Georgia to deliver natural gas to Vancouver Island.

Magna Pipeline Co., Ltd., Vancouver, has awarded the $7,000,000 contract to British Insulated Callender's Cables, Ltd. It calls for parallel 7-in., reinforced plastic lines which would move 50,000,000 cu. ft. daily at 1,500 psi.

The lines would make a 14.3-mile underwater crossing of the Strait of Georgia, at a maximum depth of 810 ft. They would then cross Galiano and Saltspring islands, making underwater crossings of Trincomali Channel and Vesuvius Bay.

The plastic pipe will have 18 sheaths or wrappings, including five reinforcing sheaths of steel tape, four anticorrosion wraps, an armor of galvanized steel wire, and several interspersed wraps of cotton or jute bedding. The last three wraps would be bituminized protective coats.

Idea for such a line has been under consideration since Magna Pipeline was formed in 1953 to explore the feasibility of moving gas from the mainland to the island. It is patterned somewhat after the World War II Pluto line which carried products under the English Channel to fuel the Allied Army after the Normandy landings.

Actual construction of the Magna line is planned for 1963.

Flexible pipe for the operation will be manufactured in England by a submarine-cable subsidiary of British Insulated Callender. It will be laid with equipment similar to that used for deep-sea telegraph and telephone cables.

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Satellites Get No Soviet Oil Bargains

• Figures show that a country behind the Iron Curtain shells out more for Russian crude and other products than a free-world buyer. And since Red nations have to buy where they're told, Russia ends up with a monopoly.

RUSSIA may be a fierce price cutter in free-world oil markets, but it runs a strictly monopolistic show behind the Iron Curtain.

Latest available Soviet figures on oil exports make it clear that Russia has two distinct sets of oil prices and Communist Bloc nations get the short end of the stick.

A special supplement to Vneshnyaya Torgovlya, an organ of the USSR Ministry of Foreign Trade, shows that in 1959:

... **Crude sold to Communist Bloc** countries for an average of 90 rubles per ton compared with 56 rubles to free-world customers. This is roughly $3.03 per bbl. against $1.88 per bbl., at the official rate of 4 rubles to the dollar.

... **Fuel-oil** exports to the Soviet sphere were valued at 66 rubles per ton compared with 45 rubles, or $2.46 to $1.68 to the free world.

... **Diesel-oil sales** to Communist countries averaged 130 rubles per ton against 100, or $4.39 per bbl. against $3.38.

... **Kerosine exports** sold for 138 rubles per ton to bloc countries against 110 rubles to free-world customers—about $4.31 per bbl., against $3.44.

... **Narrowest spread** was in gasoline, with exports to Communist countries averaging 157 rubles per ton or only 7 rubles more than prices for the free world. This was about $4.62 per bbl. against $4.41.

The figures do not reflect Russia's low prices in today's free-world markets, which average 10 to 20% less than going prices. Nor do they necessarily reflect deals made in 1959, because deliveries undoubtedly included oil purchased under older contracts.

But the Russian statistics leave no doubt that widespread price discrimination is practiced against Russian satellites and Red China. There might be a possibility that high prices on satellite sales to Russia could offset steep oil prices, but an economist's study of comparative values has shown that this is not the case.

Through design or because of impersonal economic forces, Russia definitely is in the role of a monopolist.

Satellite representatives can and do haggle over prices at trade conferences. But Russia is both the biggest buyer and seller of all products. Other Communist countries are not free to shop around for bargains in free-world markets.

While the Russian prices, according to the U. S. Department of Interior, are f.o.b. Soviet ports or land border, the values in some cases may reflect transportation costs within Russia. A long, expensive

What Russia Got for Crude Exports in 1959

	Thousands of metric tons	Thousands of Soviet rubles	Prices (rubles/ton)	Approx. price* ($/bbl.)
FREE-WORLD COUNTRIES				
Argentina	194.5	8,605	44	$1.47
Austria	483.3	36,246	75	2.50
Brazil	59.4	3,719	63	2.10
Egypt	970.8	51,159	53	1.77
Finland	899.8	46,093	51	1.70
France	122.7	6,297	51	1.70
West Germany	261.4	12,933	49	1.63
Greece	265.9	15,917	60	2.00
Italy	2,360.3	120,863	51	1.70
Japan	112.3	5,507	49	1.63
Morocco	64.6	3,654	57	1.90
Uruguay	325.1	20,519	63	2.10
Yugoslavia	413.4	28,475	69	2.30
Totals	**6,533.5**	**359,987**	**†56**	**†1.88**
COMMUNIST NATIONS				
China	635.9	54,955	86	2.87
Czechoslovakia	1,819.4	168,890	93	3.10
East Germany	1,582.0	124,590	79	2.64
Hungary	1,204.3	108,316	90	3.00
Mongolia	27.2	2,765	102	3.40
Poland	683.0	64,961	95	3.17
Totals	**5,951.8**	**524,477**	**†90**	**†3.03**

*Computed on a basis of 4 rubles to the dollar, the official rate of exchange, using a conversion factor estimated at 7.5 bbl. per ton of crude.
†Average.

overland haul could account for a high kerosine price of 305 rubles per ton, or about $9.54 per bbl., for kerosine sold to Afghanistan, and 260 rubles, or $8.13 per bbl., for the same product marketed in Mongolia.

It is virtually impossible to pinpoint the exact value of oil in terms of dollars because of extensive barter deals, where only sketchy information is available. The exact value of the ruble is also elusive. Tourists get an exchange rate of 10 rubles to the dollar.

At the same time, however, there is no doubt about the wide average spread in prices on exports to Communist and free-world countries.

Prices falling . . . The downward trend in Soviet oil prices has been apparent for several years. The average price of all exports was 90 rubles, or roughly $3.21 per barrel, on a basis of 4 rubles per dollar and 7 bbl. per ton.

In 1958 the average price slipped to 75 rubles, or about $2.68 per bbl. In 1959 it was down to 71 rubles, or $2.54 per bbl.

Significantly, Communist countries take most Russian exports of kerosine and gasoline, the only two products which showed a price rise between 1958 and 1959. Gasoline rose from 152 to 156 rubles in the period, or from about $4.47 to $4.58 per bbl., on a basis of 8.5 bbl. per ton. Kerosine rose slightly from 124 to 125 rubles, or about $3.88 to $3.91 per bbl.

Exports of fuel oil, the key product in most markets outside the U. S., fell from 73 rubles or $2.72 per bbl. in 1957, to 54 rubles or $2.02 in 1958. The price dropped further in 1959 to 46 rubles, or $1.72 per bbl., on a basis of 6.7 bbl. per ton.

Diesel-oil exports fell from 129 rubles or $4.81 per bbl. in 1957; to 111 rubles or $4.13 in 1958; and to 110 rubles or $4.10 per bbl. in 1959, assuming 7.4 bbl. per ton.

Fuel oil and diesel oil are sold mainly to free-world countries. These markets in 1959 took 52% of Russian crude exports, 68% of its diesel-fuel exports, and 95% of its fuel-oil exports.

In contrast, free-world countries took only about 11% of Russia's gasoline exports and 44% of its kerosine exports.

Gulf of Paria Drilling Halts

. . . while five-company combine takes a hard look at the poor returns from huge investments of time and money.

DRILLING OPERATIONS in the Gulf of Paria have been suspended by Paria Operations for a revaluation of the disappointing results in one of the most expensive exploration programs on record. The suspension of operations by the five-company group came after 20 wells had been drilled. Six tests have been completed as relatively low producers.

The partners paid $101-million in concession payments for six blocks covering 154,239 acres during the rush for Venezuelan acreage in 1956-57.

Another $2.2 million has been invested in exploration and development. Ohio Oil, Texaco, and Continental Oil each hold 25% interest. Cities Service has 16⅔% and Richfield Oil 8⅓.

Dr. Juan Pablo Perez Alfonzo, Venezuela's oil minister, said Paria Operations output is fairly low and does not appear commercial at present.

The initial discovery, Posa 112-1, tested at rates up to 1,980 bbl. daily. The 1958 find is 10 miles west of Soldado offshore field, on the Trinidad side of the boundary.

Soviets Shoot for Record Crude Output

RUSSIA PLANS to increase crude output this year to a record 164 million metric tons, or about 3,280,000 bbl. daily, a rise of 11% over last year's estimated 2,950,000 bbl. daily.

If the goal is reached, it will further entrench Russia's position as the world's second-ranking crude producer behind the U. S. The Soviets edged Venezuela out of second place last year.

Russia admits the 1961 rate of growth in crude production will again outstrip gains in refining capacity. This will provide a basis for higher crude exports.

The country is already well ahead of schedule in its program to produce from 4,600,000 to 4,800,000 bbl. of crude daily in 1965.

Gas production this year is scheduled to rise 34% and may pass 60 billion cubic meters, or about 5,800,000 M.c.f. daily.

Manufacture of more steel pipe and non-metallic pipe suitable for oil and gas industry use will be emphasized in 1961. This will be part of a planned over-all gain of 32% in oil-equipment manufacturing.

The government concedes a shortage of steel pipe, compressors, pumps, and other equipment is holding back the development of the oil and gas industry and is slowing gassification of cities and towns.

Delhi-Taylor Spuds Deep Panama Test

DELHI-TAYLOR has spudded its first deep test in Panama to evaluate a 1,300,000-acre concession which borders Colombia.

The well is projected to 8,000 ft. Delhi-Taylor already has drilled five shallow tests for geological information.

Drilling is being done by a Panamanian subsidiary of An-Son Drilling Co., Oklahoma City, for Panamanian Delhi Petrolera, Inc., subsidiary of Delhi-Taylor Oil Corp., Dallas.

The company obtained the concession in Darien Province 3 years ago (OGJ, Sept. 16, 1957, p. 118) and began its exploration program immediately. Besides the big inland concession, it holds one of about 360,000 acres which lies near the coast and which includes some submerged acreage in the Gulf of San Miguel.

The 8,000-ft. wildcat is being drilled near the junction of the Chucunaque and Membrillo rivers about 30 miles south of Yaviza. The rig was barged and moved by jungle trail to the site.

Soviet Rigs to Drill in Syria

- **Three Russian rigs will help develop Karachuk field as the Syrians shoot for substantial production.**

SYRIA EXPECTS to open Karachuk oil field by 1964 with an initial daily production of 40,000 bbl.

Plans for the government-operated field were disclosed in a report by Dr. Muhyi Al-Din Taufiq, head of exploration for the Syrian branch of the United Arab Republic's General Petroleum Authority.

The field will be developed with the help of Russian equipment. Three, heavy, Soviet-built rigs are expected to arrive on location this month.

The initial find in Northeast Syria was made 5 years ago by J. W. MenHall, a Syrian-born American independent. Atlantic Refining and Portsmouth Steel entered the venture later as partners. The rights, on 11 tracts covering 770,000 acres, were cancelled and assets, property, and equipment were taken over by UAR late in 1958.

The government charged that drilling did not cover a wide enough area, and that an interest was transferred to Atlantic Refining without approval.

Delineation drilling will be continued until mid-1961, while infill development wells will be drilled for the next 3 years. A 500-mile pipeline to a terminal on the Mediterranean is expected to be built by the time the field is ready to open.

The first few wells were rated at 500 to 700 bbl. daily. The eighth well, completed last year, tested 3,500 bbl. daily through a 2-in. choke.

Proved reserves of Karachuk are estimated by the government at 150 to 160-million tons, or about 1.05 to 1.12 billion barrels. The estimate is expected to be raised after further delineation and deep driling in the area.

Production, transportation, and marketing of crude is expected to start in 1964 and 1965. The report does not disclose where the crude would be marketed.

Syria consumes about 15,000 bbl. daily, which now is taken off Iraq Petroleum Co.'s pipeline system to the Mediterranean.

Egypt is a possible buyer. It exports relatively small amounts of crude.

Refining Units in Brazil to Open Soon

FIRST UNITS of Petrobras' new Rio de Janeiro refinery are nearing completion and are scheduled to go on stream in early spring.

Other units of the 90,000-bbl. plant won't be ready until late this year.

Facilities nearest completion are a 90,000-bbl. crude unit, a 11,800-bbl. reformer, and gasoline and LPG treating facilities. This fall a 21,300-bbl. fluid cat-cracker, a 5,000-bbl. hydrodesulfurizer, and a 12,000 to 15,000-bbl. propane decarbonizing unit will be brought on stream.

Dedication of the plant is scheduled January 20. Brazil's President Juscelino Kubitschek will preside at the ceremonies.

The plant is designed to operate largely on foreign crudes. But inclusion of the decarbonizing unit will make it possible to use the highly waxy (about 75° F. pour point) Bahia crude.

Currently some 35,000 bbl. daily of this crude is used in the government oil agency's 110,000-bbl. plant at Cubatao, Sao Paulo.

The Rio refinery will enable Petrobras to supply almost all of Brazil's oil products. With demand running less than 300,000 bbl. daily, Petrobras' refining capacity soon will total 252,000 bbl.

Six privately owned plants add another 56,000-bbl. capacity to this total.

FOREIGN BRIEFS . . .

A $35-million petrochemical complex will be built at Zagreb, Yugoslavia, with the help of the U. S. Development Loan Fund and other sources. Foster Wheeler Corp. will provide engineering and supervise construction on six units for the operating company, Organsko Kemijska Industrija.

North Korea's first refinery will be built by Russia under terms of a technical-assistance agreement. The Soviets also will supply crude for the 40,000-bbl. plant.

Russia's first natural-gas pipeline in Central Asia has been completed. The 400-mile system runs from Jarkak gas fields, near Bukhara, to Tashkent via Samarkand. The line will be extended another 500 miles to Chimkent, Dzhambul, Frunze, and Alma-Ata, near the Chinese border, by 1965.

Exploration in Jordan is being abandoned by Phillips Petroleum. The company spent more than $5 million on six dry holes in its concession covering more than 8-million acres in the Dead Sea area.

First drilling in eastern Peru by Mobil International is under way. A wildcat, Zorillos 1, has been spudded about 40 miles northwest of Caliente oil field, operated by Texas Gulf Producing.

A 66,000-bbl. refinery is planned at Herrlisheim, France, about 15 miles north of Strasbourg, by Ste. Francaise des Petroles and two other companies. The $61.6-million plant will go on stream early in 1963, and will be supplied by the Marseille-Strasbourg big-inch crude pipeline.

An Indian oil discovery has been made in the Rudrasagar region of Assam. Shows of oil and gas were encountered in several zones below 10,000 ft. by the country's Oil and Natural Gas Commission.

new Dowell acidizing aid boosts production–improves success ratios

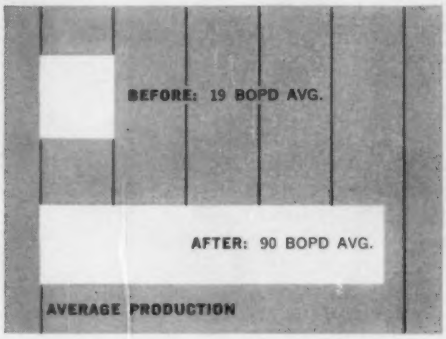
Slugs of gelled water injected between batches of acid are effective temporary plugs when acidizing long pay sections. Here are results from 21 wells.

Operators in many areas have found that Dowell water gels provide an economical temporary plug for use in the selective acidizing of long pay sections. These gels contain a breaking agent which causes the gelled water to revert to a thin liquid, primarily by hydrolysis. Breakdown time varies with gel concentration, the presence of acid, and temperature. Overall treatment cost to the operator is often unusually low for the production improvement realized.

As an example, 21 oil wells in the delta area of South Louisiana were acidized using slugs of water gel between stages of acid. Production was from a series of dirty, poorly consolidated Miocene sands interbedded with silt, clay and mudstone. Depths of these wells ranged from 6400 to 11,000 feet. Here is a tabulation of results from all 21 wells:

WELL NUMBER	LOCATION	PRODUCTION BEFORE TREATMENT, BOPD	PRODUCTION AFTER TREATMENT, BOPD
1	WEST DELTA	8	8
2	WEST DELTA	63	312
3	WEST DELTA	0	17
4	WEST DELTA	41	144
5	WEST DELTA	30	216
6	WEST DELTA	42	140
7	WEST DELTA	0	223
8	WEST DELTA	35	108
9	WEST DELTA	60	203
10	WEST DELTA	0	30
11	WEST DELTA	20	22
12	WEST DELTA	24	24
13	WEST DELTA	7	35
14	DELTA FARMS	0	0
15	DELTA FARMS	0	300
16	STELLA	0	20
17	GRAND BAY	0	0
18	EAST BAY	22	35
19	EAST BAY	17	25
20	EAST BAY	3	0
21	MAIN PASS	26	32

Length of perforated intervals treated ranged up to 50 feet. Some treatments used as many as four stages of acid separated by three water gel slugs. Quantities and number of stages were engineered to meet well conditions.



Out of the 21 treatments, 15 showed a definite improvement. The success ratio of 71.5 per cent and the average production increase of 370 per cent were both considered excellent.

As shown above, this water gel, made from water and a Dowell addition agent, is free of solids. It serves well as a temporary plug, yet it thins readily. Viscosity can be tailored to suit well conditions.

When you consider acidizing a long pay section, check with your Dowell representative about water gel slugs. These gels have been used successfully in many areas. Dowell services and products are offered from more than 150 offices and stations in the United States, Canada, Venezuela, Argentina, Germany, France and the Sahara area. Dowell, Tulsa 1, Oklahoma.

SERVICES FOR THE OIL INDUSTRY

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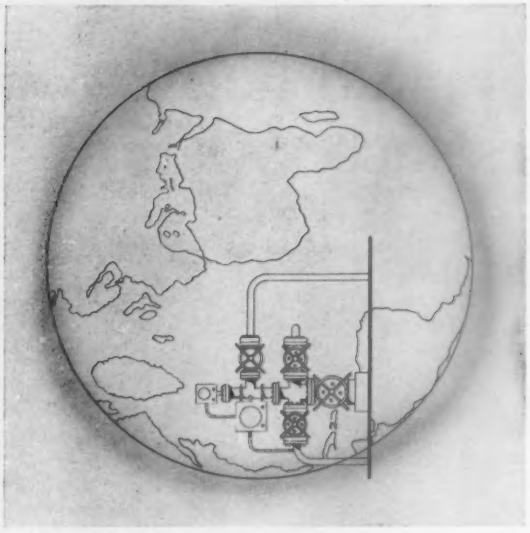


Would world proration solve the problem of ruinous surpluses?

There are those who think so . . . and some serious study is being given to working out a means of implementing it. Here's one approach to it.

BY M. J. SLADIC
Formerly of
Directorate General of Petroleum
and Mineral Affairs
Saudi Arabia

INTERNATIONAL PRORATION would allow some of the world's most underdeveloped nations to take advantage of their immense oil reserves to move toward self-sufficiency. And it would protect the oil industry from the ruinous and crippling surpluses.

Any nation which accepts proration must of necessity surrender a portion of its individuality and sovereignty, but programs of this nature can be successful. Members of the European economic bloc are enjoying considerable success.

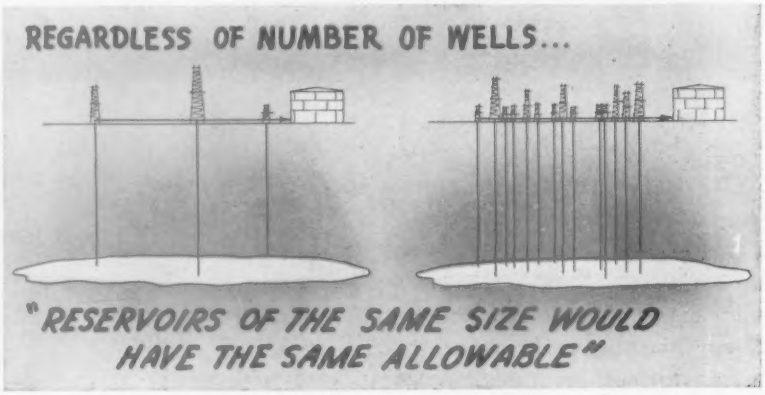
Procedures and administration can be worked out to include standardized reserve calculations, standardized economic evaluations, a proration formula, and a fair method for assigning allowables to new producing nations. However, about 3 to 5 years would be required.

Active participants. The proration formula would be applied only to net exporting countries, approximately 15. Whether a country is a net importer or net exporter would be defined by the oil produced less internal oil consumption. Subtracting the total imports from the total exports would result in the same figure.

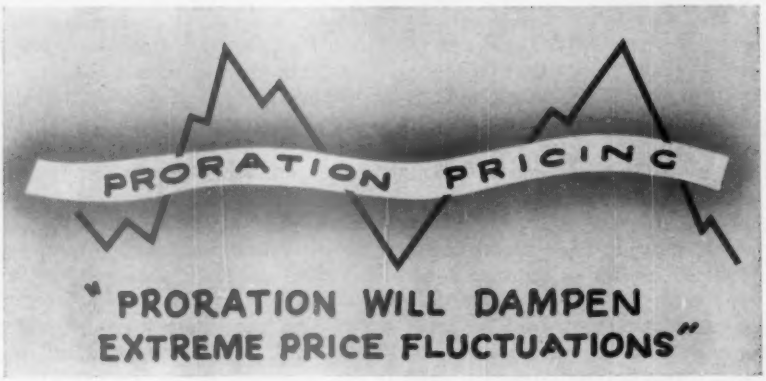
The most difficult step is the development of a proration formula satisfactory to the participants. This is allied with oil conservation.[1] Proration would then depend upon the capability of reservoirs to produce efficiently. Each reservoir would be assigned a maximum allowable. The amount produced from each reservoir would be the nation's allowable, multiplied by the reservoir's maximum allowable, divided by the total maximum allowable for all the reservoirs within the nation.

In turn each operator would be assigned an allowable in direct proportion to the leases or blocks he operates. If gas or water encroachment or any inefficiency makes this impractical, the reservoir should be unitized. Admittedly, special cases come up where an operator may be deprived of a reasonable return on his investment. For this, some means of compensation in production could be devised. It should be devised in such a manner, however, to discourage additional unneeded investment in order to increase allowables.

Thus, the oil produced from a reservoir should be related to the reserves and the reservoir's capabilities, rather than dependent upon an arbitrary well spacing, a well-depth factor, or well-potential factor. Moreover, the number of producing wells in a field should suit



Paper presented at Second Arab Petroleum Congress, Beirut.



the capabilities of the reservoir. The reservoir should not be produced to suit the wells and facilities.

International Objectives

The objectives of international proration include:

1. Avoiding extreme crude-price fluctuations—proration will dampen extreme price fluctuations and prevent a flood of oil into the market. Each company and country should have a much clearer picture of the amount of oil it is capable of selling.

2. Pooling efforts to insure competitive price with other forms of energy and sources of hydrocarbons.

3. More uniform development of each nation's oil resources.

4. Standardization at a national level of proration and conservation principles, aims, and methods.

Competition angle. Undoubtedly proration will be lambasted as an attempt to wipe out competition. This should be the least of its problems. Though it will tend to keep the prices of crude oil from getting uncontrollably low, crude will have to compete with shale oil, atomic energy, and coal.

Competition will continue in obtaining the markets closest to the source and markets in countries from which the exporting countries are importing appreciable quantities of other goods.

Whereas international proration deals mostly with pricing, marketing, and competition with other sources of energy, national proration is closely allied with conservation and technical problems. It is important to note that the economics and efficiencies effected by national proration will enhance the fulfillment of international objectives.

This is best illustrated by the rising investment and operating costs per barrel in the United States, where 20 and 40-acre spacing and in many cases a well on 5 or 10 acres, justified by the law of capture, resulted in unnecessary expenditures. More unified efforts among the states through the medium of the Interstate Oil Compact Commission could decrease the gravity of the problem.

No matter what approach is made to the problem, the proration of the oil revenues from a unitized or jointly operated reservoir, with planned well spacing and development, will yield lower investment and operating cost per barrel.[2 3 4 5]

Reasons for Proration

The premises which strongly urge proration are:

Oil resources are the principal assets of most net oil-exporting nations.

Oil, gas, and coal used as energy are wasting assets (resources). Agriculture is reproducible and expandable; minerals and metals are lasting and to an extent salvagable; while the life of hydrocarbons and coal ends when they are consumed as energy.

Oil and gas should not be wasted under any circumstances, since they will be used as both a source of energy and hydrocarbons for plastics, chemicals, etc., until complete depletion occurs.

The demand and the price of exported oil and its derivatives do not fluctuate in strict accordance with the law of supply and demand, because importing nations impose taxes and quotas to control imports and protect their own coal and hydrocarbon resources. Certainly importing nations have a right to impose these controls. This, however, partly justifies offsetting controls imposed by exporting countries.

Proration has strong justifications and objectives but they must be carried out with proper moral convictions to be successful. Exporting nations will have to accept the fact that importing nations will continue to protect their currency and domestic sources of petroleum, gas, and coal through quotas and duties.

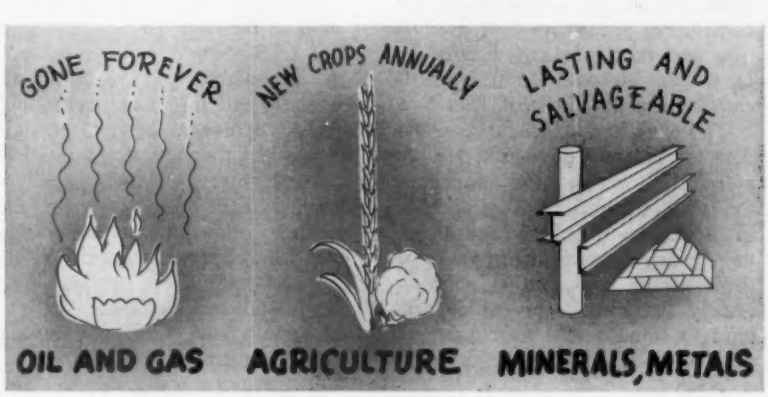
When oil is exported to a particular country the objective should be to make up deficiencies in the importing nation's requirements, rather than compete with the nation's own sources of supply.

International Formula

A possible international proration formula is based on these factors:

1. The average annual net export achieved during any 3-year period preceding proration. Any nation may declare at any level below the average. Nations with limited oil resources may choose to declare a lower figure to lengthen the productive life of their resources or to stay within an efficient rate of production.

2. Each nation's reserves for export with respect to the total re-



serves available from all net exporting nations.

3. The net world demand.

This proration formula to determine a total allowable would be the declaration, plus the product of the ratio of the exporting nation's reserves to the total reserves of all nations ready to export above their declaration, and the difference between net world import demand and the total of all nations' declarations.

The formula can easily be rearranged to deal with a decrease in demand. For example, consider nation A in Table 1. Its total export allowable equals 547, its declaration; plus the ratio of its reserves to total reserves for proration, 50/100; times the difference between net demand and total deductions (2,350−2,064). In short the total export allowable = $547 \div 0.5 \times 286 = 690 \times 10^6$ bbl. for the year.

TABLE 1—SUMMARY OF INTERNATIONAL PRORATION WITH FIVE NATIONS PARTICIPATING

Nation—	A	B	C	D	E	Total
Total net export, 3 years average, 10^6 bbl.	547	438	329	730	182	2,226
Declaration, 10^6 bbl.	547	438	329	600	150	2,064
Reserves, 10^9 bbl.	50	30	20	10	5	115
Production-to-reserves ratio	0.0109	0.0146	0.0165	0.06	0.03	0.018
Reserves for prorates, 10^9 bbl.	50	30	20	....	....	100
Proration factor	0.5	0.3	0.2	....	....	1.0
Increase in export allowables, 10^6 bbl.	143	86	57	....	....	286
Net world import demand, 10^6 bbl.	690	524	386	600	150	2,350

Basis fair. This formula is fair in several ways. By basing it upon the maximum average yearly production achieved over a 3-year period, there is reasonable assurance for any nation, whose oil availability is declining, that should a new discovery be made, there will be considerable leeway. Using a maximum average, any nation, which has achieved a certain level of production and received taxes accordingly, will be protected from a drastic cutback due to proration.

Those nations which have abundant reserves will have gradually increasing allowable over and above the previous maximum production in proportion to reserves. Furthermore, each of these nations will be depleting its resources at approximately the same rate, which will tend to smooth out, over a longer period, the ups and downs of their income.

To illustrate the use of this formula internationally, Table 1 shows how it would work with five nations participating. The illustration is fictitious but realistic numbers were selected.

One of the important factors not covered by the formula is the allowable for an exporting nation which does not have production or is in the process of reaching a reasonable level of production when proration is established. One method would be to determine a fair annual production-to-reserves ratio.

TABLE 2—RATIO OF PRODUCTION TO RESERVES FOR SIX MIDDLE EAST NATIONS

Nation—	Reserves, 10^9 bbl.	Production to reserves ratio	Period
Bahrain	0.160	0.082	Avg. 57-58
Qatar	1.650	0.035	Avg. 57-58
Iraq	21.800	0.0122	1958
Iran	32.000	0.0088	Avg. 57-58
Saudi Arabia	44.000	0.0083	Avg. 56-58
Kuwait	56.000	0.0082	Avg. 56-58

One way to arrive at this ratio is to develop its current relationship with reserves. To illustrate how this might be done the actual reserves and production for net export Middle East nations are presented in Table 2.

These data are also presented in Fig. 1. Though the relationship is not a straight line, the data conveniently fall into a pattern which can be expressed by two straight lines with a common intersection.

A minimum allowable should be established for all net exporting nations. By allowing a minimum of at least 1%, approximately 65×10^6 bbl. per year, of the net world demand, additional countries can be eliminated from regulation by the allowable formula.

Furthermore, some consideration must be given to producing countries which may gradually expand their production into a net export situation. Even if a 2% minimum allowable were established it is doubtful that the major net exporters would feel it to any great extent.

Each nation participating in international proration should apply conservation principles. If these are applied properly, nations with reserves of 5 billion barrels or less and an expanding local consumption will probably not exceed the minimum allowable net export, especially if it is 2% of the net world demand.

A similar minimum allowable method could be based upon a percentage of the new world import demand. In this manner the minimum allowable would fluctuate in direct proportion to the net world import demand.

Four-Point Program

The program, then, reduces to four points:

1. A basic formula with which to calculate the allowables of the participants. This formula must include a factor to represent each nation's past participation in supplying world demand. The other important factors are each nation's recoverable reserves and their proportion to the total reserves of active participants.

2. A method to allow new participants and those in the process of expanding their facilities a fair allowable consistent with their reserves and other countries' allowables.

3. A minimum allowable of 1 to 2% of world demand, or an equivalent percentage of net world import demand for new producers or new net exporter.

4. Sufficient flexibility so that new exporting countries may also consider the economics of any set

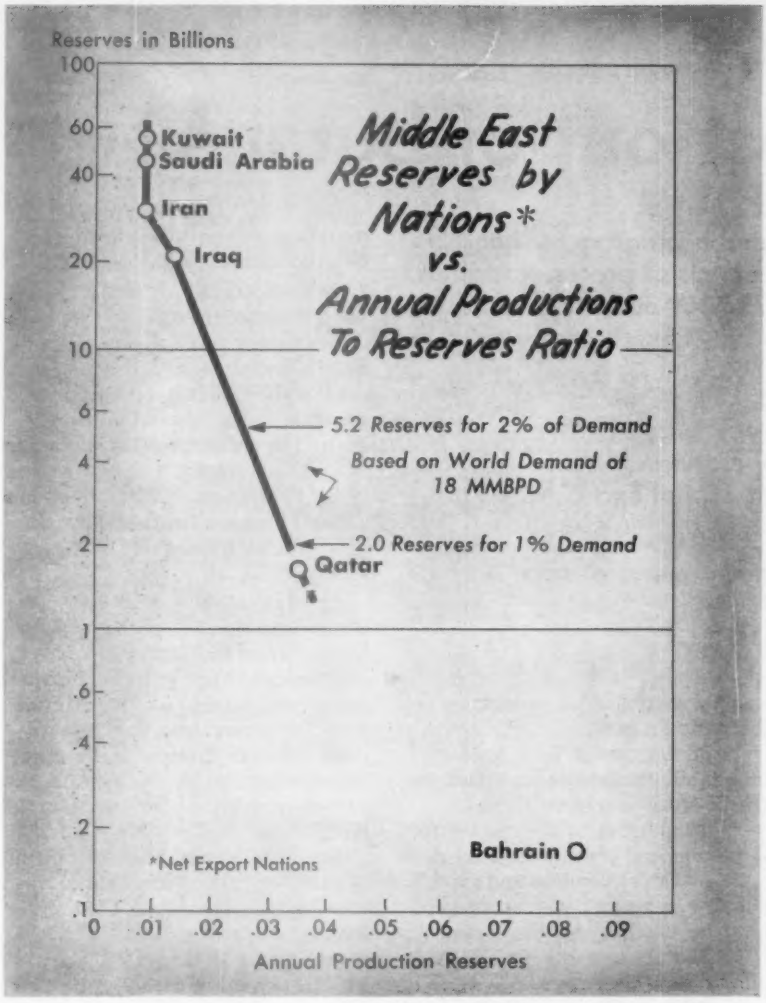


Fig. 1.

allowable. Though reserves are one of the most important factors to be used in proration, some reserves cost more than others to produce. It could happen that an allowable set for a new exporter might be insufficient for the new producing companies to gain a reasonable return on their investment.

One method of insuring a fair allowable for everyone would be to test the proposed formula based on reserves by actually determining the return on investment. For example, once the allowable is set, an estimate of each company's return on investment could be made. Should all companies show a potential return of 25-35%, except for one or two companies yielding 10-15%, then it would seem fair to allow say 20-25% return through increased allowables, provided that the reservoirs would be put into no serious jeopardy.

National proration would follow a similar pattern, mainly allotting production according to reserves and a reservoir's capability to produce efficiently.

Much work would need to be done to develop fully the four main technical and mechanical requirements. Standardization of reserve-estimating techniques for the participants would be one of the first steps. In turn reserves might be recalculated in some instances. Studies would be required to determine when economic analyses should be accepted as a criterion for determining allowables.

After the reserves are set on a common basis, additional statistical analyses will be necessary to determine the minimum allowable and the allowable for new producing nations. It is most likely that a set of conservation and proration principles and formulas common (acceptable) to all exporting nations must be formulated to form a common base for the international formula and regulations.

The proration of oil to specific wells or leases of a single reservoir could be called the third order. This type of proration is necessary for most reservoirs in the United States, because more than one operator has leases on a single reservoir.

Disadvantages. Proration on an international basis, though justifiable, can develop political-economic factors which can not be overlooked. Countries dependent upon oil imports can easily be forced into seeking other sources of energy irrespective of economics.

Also intentional or inadvertent tendencies towards nonscheduled and nonplanned nationalization could become uncontrollable. Since these factors should not be the objectives of proration, adequate and open measures should be taken to offset the possibility of their occurrence.

Another important political-economic factor, which could eventually confront the proration participants, is the urgent need for unanticipated income by one of the exporting nations. Should this occur, there will be a strong tendency to break from the plan. This could be covered by a special allowable, if the allowable extends long enough to justify the economics (facilities vs. revenue) of meeting the increase in production. For any given situation the economics should be investigated. Should this approach be unattractive, then a loan, either sponsored or provided by the other exporting countries, should be considered.

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How a computer helps Atlantic

Get the most out of butane

Atlantic Refining Co. has developed a program for handling refinery butanes. It includes the effects of process variables, inventories, and gasoline specifications on butane excesses and requirements and alkylate production. It can be used to

- **size new equipment**
- **improve operating efficiency**
- **evaluate refinery operation**
- **take a closer look at capital expenses.**

BY JOSEPH R. AICHER, PAUL D. BIRKHAHN, AND H. C. LESTER, JR.
Atlantic Refining Co., Philadelphia

BUTANES AND BUTYLENES are becoming increasingly valuable raw materials. The demand for higher-octane gasolines has spurred a rise in alkylation capacity in spite of reduced demand for aviation alkylate. At the same time, the rapid rise in petrochemical production is also creating greater demand for butanes.

Every major process in a cracking refinery affects the total volume, type, and ultimate disposition of butanes produced. In our experience, butane disposition and value have been major factors in evaluating refinery operations. Detailed calculations are required to assure that we are using our C_4's in the best possible way. For this reason, we have developed a computer program to handle butane calculations.

Program Development

First step in developing the program was to take a critical look at all of the known variables which affect butane-butylene availability and disposition. Care was taken in these early stages to view the problem in its widest aspects to avoid overlooking significant variables which might normally be fixed by custom as nonvariable or insignificant.

The butane flow diagram is shown in Fig. 1. The following factors were considered in making up the basic program:

1. Production of light hydrocarbons and gasoline is modified by charge-stock inventory.
2. Yield from and capacity for alkylation and polymerization.
3. Inventory volumes and capacities for n-butane, isobutane, and catalytic butanes and butylenes.
4. Butane recovery from stabilized gasoline streams.
5. Blending specifications and volumes of finished gasoline and intermediate gasoline components.
6. Restrictions, if any, on the maximum rate at which butane may be purchased.
7. Composition of both excess and purchased butane.
8. Certain process options were also included:

(a) Alkylation of C_3-polymer gasoline.

(b) Dependentanization of reformer stock or reformate.

(c) Refractionation of gasoline streams for blending flexibility.

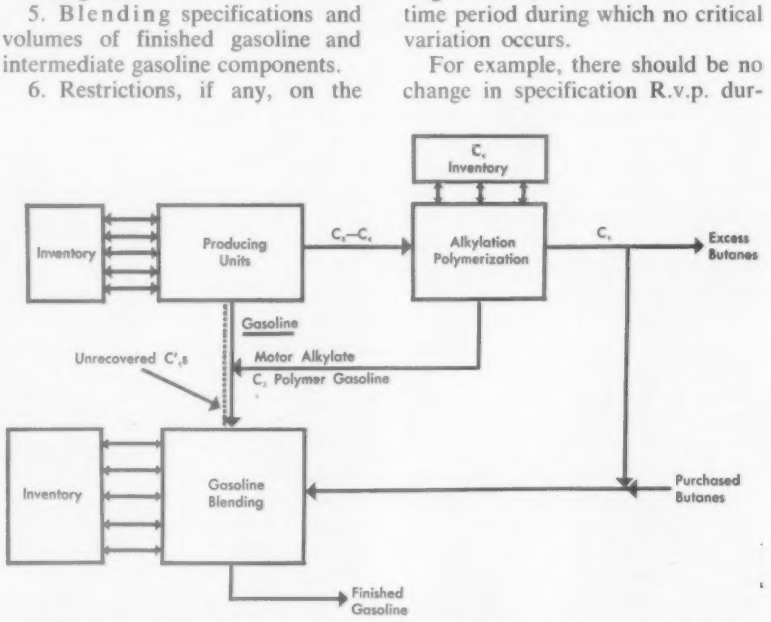
(d) Prefractionation of alkylation-unit feed.

In addition, inputs for two catalytic crackers and two catalytic reformers were included:

Although Fig. 1 indicates that purchased butanes should be suitable for direct blending into gasoline, butanes brought in by crude fortification and by the light-hydrocarbon-recovery system can also be handled.

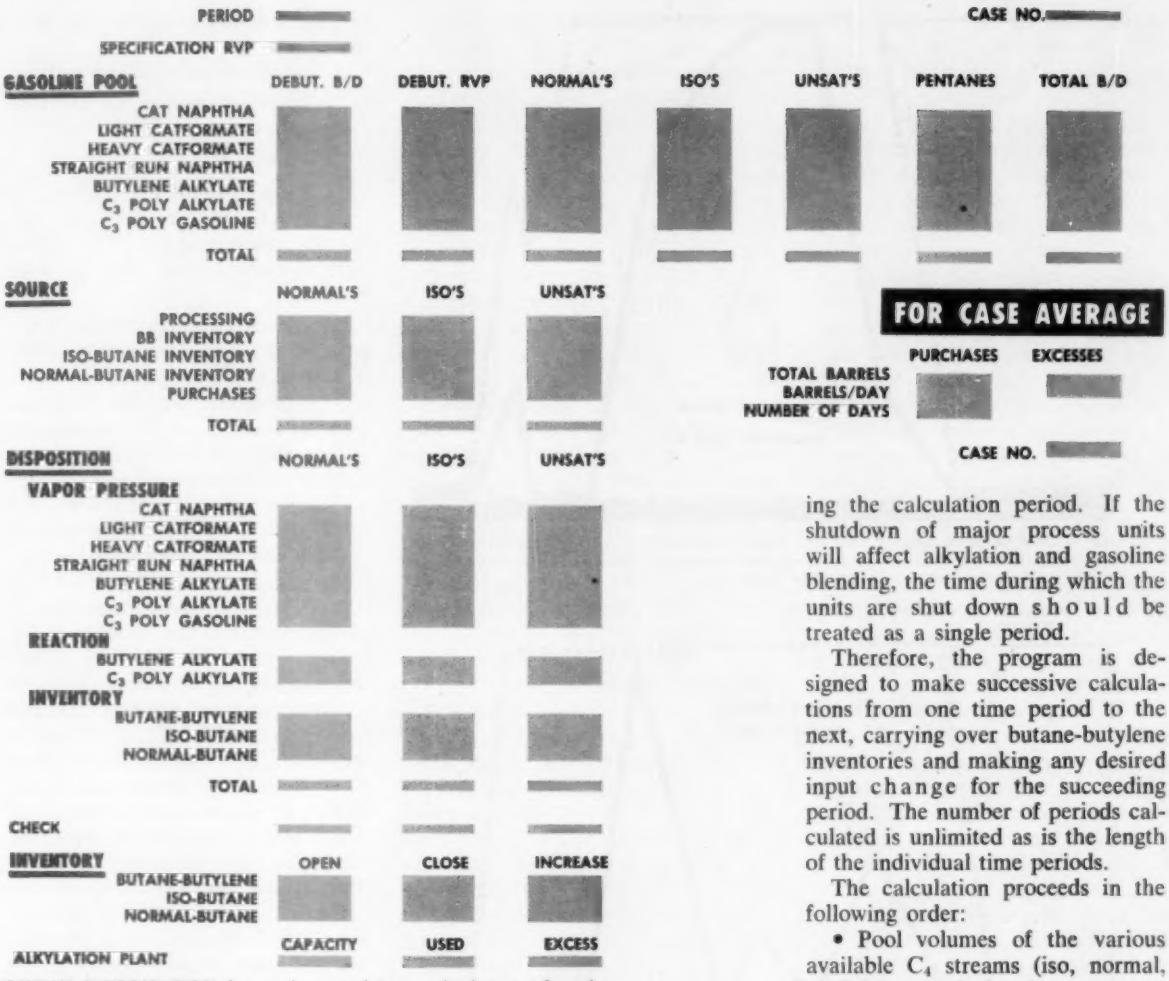
The factors which affect butane availability and disposition vary continually. There are, however, a few which are critical. For this reason, it is desirable to make a single calculation over the shortest time period during which no critical variation occurs.

For example, there should be no change in specification R.v.p. dur-

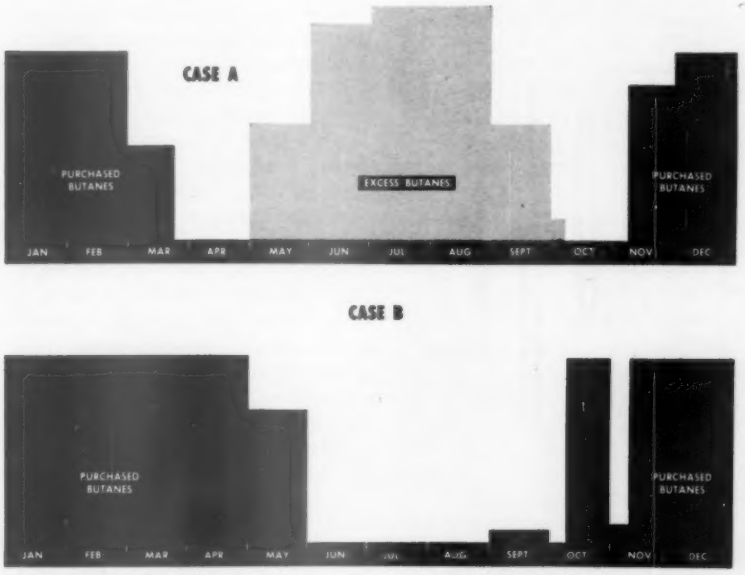


BUTANE FLOW DIAGRAM for a typical refinery. Factors shown are included in the basic program. Fig. 1.

Presented to WPRA computer conference, Tulsa, November 1960.



OUTPUT INFORMATION for each period is punched out. After the last period an average of all the periods is computed and punched out in a summary table. Fig. 2.



COMPARISON of the two cases shows the desirability of eliminating excess butanes and spreading purchases over a greater portion of the year. Fig. 3.

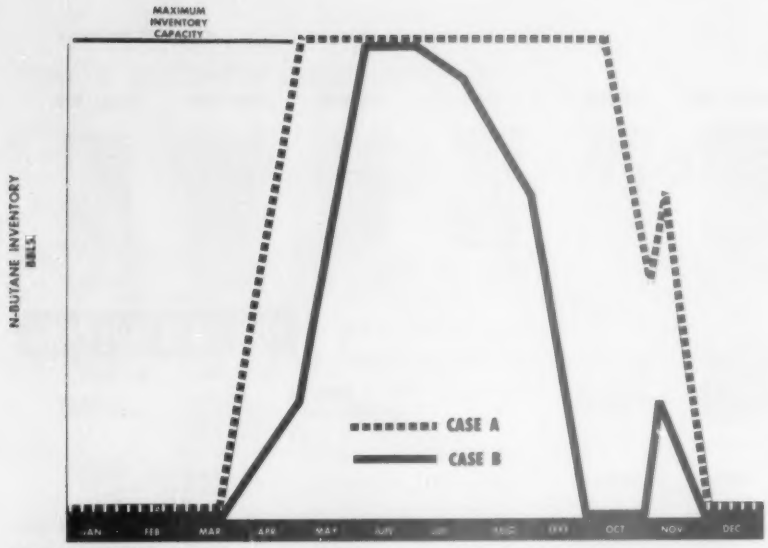
ing the calculation period. If the shutdown of major process units will affect alkylation and gasoline blending, the time during which the units are shut down should be treated as a single period.

Therefore, the program is designed to make successive calculations from one time period to the next, carrying over butane-butylene inventories and making any desired input change for the succeeding period. The number of periods calculated is unlimited as is the length of the individual time periods.

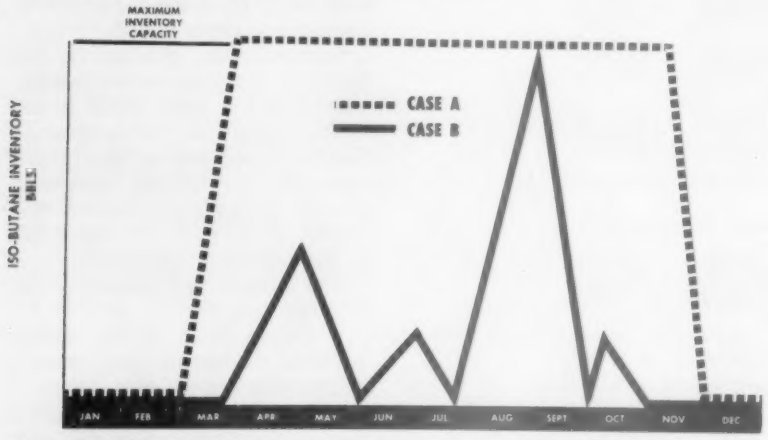
The calculation proceeds in the following order:

- Pool volumes of the various available C_4 streams (iso, normal, olefinic) are calculated.
- Balanced feeds, such as C_4 charge to an alkylation unit, are allocated.
- Various gasoline streams are then brought to specification vapor pressure with pentanes (if any are available) and unrecovered C_4's. The C_4 pools are used in a preferential order designed to maximize alkylate and gasoline production. Vapor-pressure technique is based on rate of change of the vapor pressure of a stream with respect to C_4 addition. Purchased butanes are used if necessary to complete the job.
- Checks are made on component availability and alkylation plant capacity to determine if C_3-polymer gasoline can be alkylated. If so, a linear program is used to get maximum efficiency from the available pools, inventories, purchases, and plant capacities in the production of vapor-pressured C_3-polymer alkylate.

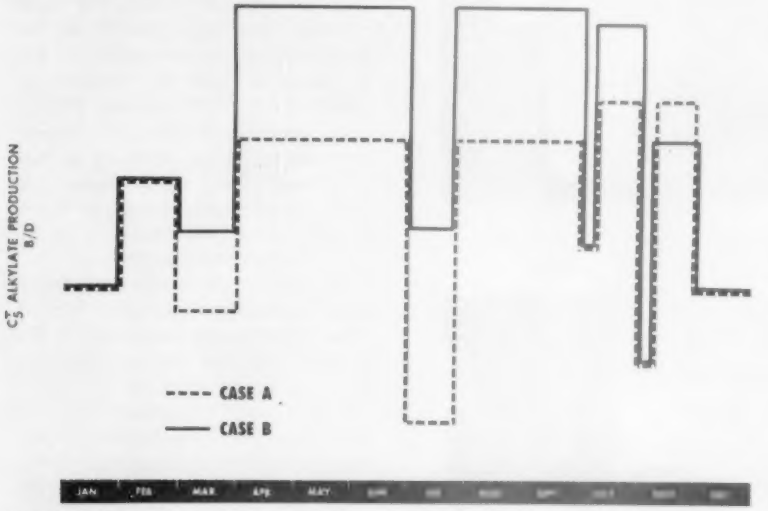
Output information for the period



ANOTHER COMPARISON shows that for Case B inventory varies from empty to full, yet never becomes excessive. Case A, however, at times requires a capacity equal to 150% of the daily crude rate. Fig. 4.



WHEN RUNNING CASE A, the program says to store isobutane for use as a winter vapor-pressure component. In Case B, however, isobutane excesses are stored for later use in alkylation. Fig. 5.



VARIATION in debutanized alkylate production for the two cases over a 1-year period. Fig. 6.

is punched out (see Fig. 2). This includes:

1. Maximum alkylate production.
2. Finished gasoline volume and composition.
3. Butane-butylene inventories.
4. Excess butane production.
5. Purchased n-butane and isobutane requirements. (The latter only if required for reaction with butylenes.)
6. A monitored description of the path of the calculation along with a printout of the inputs.

The program computes each period separately, carries changes to butane-butylene inventories over to the succeeding period, makes desired input changes, and repeats until all periods have been calculated.

After the last period, an average of all the periods is calculated and a summary table is punched out.

The program was developed for use on a standard IBM 650. Memory capacity, speed, and the card handling required for this machine forced us to limit the variables to those of major significance. Even so, the resulting program is a collection of 62 subroutines which require more instructions than the IBM 650 can contain in a single drum loading.

To get around this problem a special technique was used throughout the program. Certain locations are used as temporary storage for instructions, and upon execution of these instructions, new ones are loaded into the same locations, thereby wiping out the original instructions. These new instructions are then executed followed by newer instructions being read in, etc.

There are a possible 92 major paths throughout the calculation, each of which differs by at least one subroutine. The specific path a calculation may take can not be predetermined, but is a function of the calculation itself. Thus in a card-system 650 all subroutines have to be placed in the card-reader feed hopper in the correct sequence. All instructions must therefore be read by the machine and accordingly provision was made for loading all instructions and executing only those required by the specific problem.

Two of the subroutines are linear-programing codes; and depending on the path chosen, both are used,

only one is used, or neither is used.

How It's Used

Here are some of the applications of the program:

- Periodic evaluation of actual plant operation.
- Short-term predictions to serve as operating guides.
- Yearly forecasts to determine both excesses available for sale, and purchase requirements.
- Long-range forecasts for planning purposes.
- Includes the effect of butane usage on the capital cost of process equipment.

The following cases were calculated for a hypothetical but typical refinery. They show the type of results which can be obtained from the program.

Case A. Mediocre recovery of processable butanes from stabilized gasoline streams. Alkylation of butylenes only.

Case B. Excellent butane recovery. In addition to butylenes, C_3-polymer gasoline is alkylated when possible.

All other variables were held constant in this study. These major factors were included:

1. Two catalytic crackers of different capacities. One is shut down for 3 weeks in March and the other for 3 weeks in July.
2. Two catalytic reformers of different capacities. One operates at a high severity producing reformate for premium gasoline. The other operates at a lower severity.
3. No rerunning of reformate was assumed, nor was depentanization of either reformate or reformer stock.
4. Two alkylation units of different capacities. One unit is shut down for 10 days in October and the other for 10 days in November.
5. Purchased-butane rate is limited to 1% of the daily crude rate.
6. Composition of purchased butanes: 80% n-C_4, 20% i-C_4.
7. Normal butane and catalytic butanes and butylenes equal 10% of the daily crude rate.
8. Isobutane inventory capacity is equal to 5% of the daily crude rate.

Fig. 3 shows the effect of the variations studied on excess butane production and purchased-butane requirements. In this study, excesses were eliminated while purchases were made over a greater portion of the year.

Fig. 4 shows the effect on normal butane inventory. Case A indicates a need for more capacity. This calculation shows that a capacity equal to 150% of the daily crude rate could have been used. Case B, on the other hand, has exactly the right inventory capacity (10% of crude rate) as shown by the fact that it varies from empty to full, yet no excesses are shown (Fig. 3).

Fig. 5 covers the effect on isobutane recovery. Case A used this inventory solely to store isobutane for use as a winter vapor-pressure component. Under these circumstances, it would have been more desirable to store n-butane instead of isobutane. In Case B, however, a more efficient use is indicated. Isobutane excesses are stored for later use in alkylation.

Fig. 6. shows the variation in alky throughput for both cases. Note the low production during the catalytic cracker shutdowns, especially in Case A where butylenes only are being alkylated.

Case B shows the effect of improved recovery of C_4's plus the alkylation of C_3-polymer gasoline. In this case, alkylation capacity was reached during the period from April to September save for catalytic cracker shutdown periods. (Total alkylation unit capacity was equal to 5% of the daily crude rate in both cases.) With minor changes to the input, these cases could be made to demonstrate the value of increased alkylation-unit capacity.

In case A, the increase in alkylation rate following the alkylation-unit shutdowns in the fall is the result of storing catalytic butane and butylenes during the alky-plant shutdown periods. In this case, n-butane and isobutane inventories were high at the start of October and maximum alkylation was possible without exceeding the purchased-butane limit.

Case B shows that alky rate is actually lower in November, reversing the trend shown in the rest of this calculation. The reason for this is that the n-butane and isobutane inventories were consumed prior to the first alkylation-plant shutdown. Since the purchase limit had been reached, some alkylation feed had to be backed out to bring the vapor pressure of the gasoline pool to specification.

Ideally, butane purchase should have started earlier in Case B to fill butane inventory before the first alkylation-unit shutdown. However, this program runs through the periods in order and only once. It can not foretell, therefore, what future disposition will be made of stored butanes. For this reason, we have followed the policy of never permitting purchases and excesses to occur in the same period.

Once the calculation has been made, it is easy to insert the indicated purchases and rerun the program. Two calculations are sufficient instead of the many iterations which would otherwise be required.

The fact that butane purchase should have started earlier illustrates an important facet of the program. A detail such as this might have gone unnoticed in the myriad of figures used in hand calculation. If it had been noticed, the odds are that time would not have permitted correction. Here, the change of a few cards permits the corrected version to be calculated.

We plan to include this program in a refinery-simulation program on a larger computer. Its flexible input-output design will make such a move much easier.

For refinery readers:

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HEAVY SCALING (½ in. thick in a 2 in. pipe) was not effective in retarding corrosion. On the contrary, the scale protected bacterial colonies growing under it, and the resulting galvanic cells soon pitted this water-injection pipe to the point of leakage.

Before injecting water, have you considered the question

Will corrosion eat up the water-flood profit?

- There is still a lot of work to be done to allow us to predict the occurrence of corrosion. Opinions of recognized experts in the field do not always agree with published material.
- Here are some suggestions for future research, and some ways to stay out of trouble with corrosion.

BY L. C. CASE
Consultant, Tulsa

LITERATURE on water-flood corrosion, plus opinions of recognized authorities in this field, plus field observations gives these rules for predicting equipment attack:

- Hydrogen sulfide is probably the most important cause of corrosion in water-flood systems. The attack is often most severe underneath deposits when H_2S is quite low and not indigenous to the water being used. It follows that bacteria causes most of the corrosion.
- Relatively high H_2S is usually accompanied by very mild corrosion in the absence of deposits.
- Oxygen may constitute a sole cause of severe corrosion in brackish or saline water. In only trace amounts it greatly accelerates H_2S attack.
- Carbon dioxide is open to serious question, both as a primary and secondary cause of water-flood corrosion.

Paper presented at NACE meeting, Tulsa

Prediction important. The expansion of water-flood operations in the last few years has caused operators to be more aware of equipment failures. The marginal nature of many projects now being initiated demands that these failures be predicted and included in the general cost estimate during the planning stage.

If this may be done, then the economics of lined equipment, inhibitor treatment, and replacing the failures may be compared in view of expected life of a given flood. The occurance of water-flood corrosion or its severity has not been predicted with accuracy. Thus, the

TABLE 1—Results of Questionnaire on Water-Flood Corrosion

1. List three causes of water-flood corrosion in order of importance and in view of your experience.

(a)		(b)		(c)	
Oxygen	9	H_2S	8	CO_2	4
H_2S	8	Oxygen	7	Bacteria	7
CO_2	1	Bacteria	4	Oxygen	3
Bacteria	2	$H_2S + O_2$	1	Low pH	1
				High NaCl	1

2. In observation of approximately 682 floods, 177 were noted to have serious corrosion (serious corrosion defined as major replacements in five years). The noted corrosion causes were:

(a)		(b)		(c)		Other.	
H_2S	7	Oxygen	5	Low pH	1	Combinations	1
Oxygen	7	H_2S	5	Bacteria	1	Unkown	1
$H_2S + CO_2$	1	$O_2 + CO_2$	1	CO_2	1	Poor material selection	1
Bacteria	3	Bacteria	1	O_2	2		
$H_2S + O_2$	1	CO_2	1	Electrolysis	2		

3. Have you noted corrosion in water-flood systems due to CO_2?

(a) Directly		(b) Indirectly		(c) Uncertain or Indefinite	
No	12	No	6		3
Yes	3	Yes	1		
Yes + other causes	1				

operator is inclined to assume a certain degree of corrosion and design his plant largely in view of predicted economic life of the project.

Most people agree that oxygen is a major cause of corrosion in water-flood systems. Thus it is somewhat surprising that water-flood operators fail to note the more obvious signs of oxygen corrosion and, additionally, do not generally take advantage of improved testing methods known to predict trouble from this source.

Most references to oxygen corrosion are general, in that they do not show exact corrosion rates or furnish details on attendant conditions affecting them. Published statements to the effect that 0.5 p.p.m. oxygen is innocuous are not constructive in view of both laboratory and field data proving even lesser amounts to be dangerous under given conditions. Although the accelerating effect of oxygen on corrosion due primarily to other causes is mentioned many times, no reference was found which points out the enormous acceleration of trace amounts of oxygen on an otherwise slow and even attack by hydrogen sulfide.

The literature is generally neither technical nor practical regarding early recognition of oxygen corrosion or its measurement. The effect of deposits in localizing attack by oxygen found harmless in clean systems has been given only slight consideration. Early reference was made to the effect of air on protective films to render them more pervious and less adherent. Much work remains to be done on the nature of deposits occurring in water-flood systems and the pitting attack which takes place underneath these accumulations.

H_2S Corrosion

Only fair agreement is found in the recorded ideas of various authors on hydrogen sulfide corrosion. Early statements say flood water should contain no H_2S and that the corrosion from trace amounts may be worse than oxygen corrosion. Other generalities point out that low amounts may be tolerated in the absence of oxygen and that the attack is self-stifling under these conditions .

A different viewpoint is given in several published accounts reaching the general conclusion that H_2S corrosion is not dependent on concentration and may be anything from mild to severe, depending on attendant but little-understood phenomena. Actual evaluation of the factors possibly influencing H_2S attack seems not to have been undertaken. Anomalous occurrences of severe corrosion in one system having only 2 p.p.m. H_2S and absence of appreciable corrosion in another having 20 p.p.m. or more should constitute much more than a topic for idle speculation.

References to regulating conditions are general and include the galvanic effect of sulfide deposits, pH value, salinity, temperature, velocity, and influence of welds. Acceleration of sulfide attack by some of these agents has been shown although no exact rules have been established. Salinity, pH value, and temperature are largely disregarded in recent years although previously stated to be roughly proportional to corrosion rate. The effect of sulfide deposits deserves further attention as well as the effect of other types of deposits.

Bacterial activity underneath materials which serve as a protecting cover seems to be present in most systems where appreciable deposits occur. I have observed that H_2S corrosion is usually mild in clean systems regardless of the amount of H_2S present. On the contrary, troublesome sulfide corrosion has been

noted where only occasional traces of H_2S, 0.1 p.p.m. or less, could be found. This apparent anomaly seems to be most logically explained by the fact that on clean metal the film of corrosion product tends to be impervious, tenacious, and relatively even in thickness. It follows that such films are protective and thus remain thin.

In the process of SO_4—reducer action, the sulfide is generated at colony growth and thus quite near the metal surface. Under these conditions no free sulfide may occur in the water although "black water" and injection-well plugging are in evidence. This type of attack is characterized by deep pits, usually filled with sulfide corrosion product. There should be no doubt that galvanic action greatly accelerates the pit formation.

This common and most troublesome type of corrosion usually takes place between areas of discontinuous scale or underneath thick deposits which have become more or less nonadherent. Entry of oxygen in amount so low that it may defy detection will multiply many times the rate of the active pit penetration underneath such deposits.

Carbon Dioxide

CO_2 has long occupied a prominent position among agents causing corrosion in water-flood systems. Most references have included only the general effect of corrosion acceleration by lowered pH due to CO_2. The few descriptions available as to the nature of CO_2 corrosion and the products formed in the process do not document the data or furnish actual examples from water-flood systems. Thus it seems possible that the descriptions were derived from examples of condensate corrosion rather than from those at water floods.

Certain doubts were expressed during some of the earliest work on water floods as to any direct effect of CO_2 on the corrosion taking place. Succeeding reports have largely disregarded these questions although they were based on considerable field experience. It is understandable that these reports have not added to the sum total of knowledge concerning water-flood operation since they include such phenomena as calcium carbonate-scaling conditions induced by low pH

Presently, after accepting CO_2 corrosion in water-flood systems as a fact for 10 years or more, the effects of both CO_2 and pH value seem again to be open to serious question. No known analysis of corrosion products from water floods has indicated CO_2 as a direct cause. Logically, ferrous carbonate would quickly become oxides in the presence of oxygen, or sulfides in the presence of H_2S and absence of oxygen. Nevertheless, initial attack by CO_2 should be identifiable under succeeding, protecting layers of deposit.

Any indirect effect of CO_2 such as acceleration of corrosion due primarily to oxygen or H_2S, should be easily correlated with pH value. Although many attempts have been made to find this correlation, it simply does not exist in any water-flood systems using natural or untreated water. It seems safe to conclude that CO_2 is neither directly nor indirectly associated with corrosion occurring in water-flood systems.

Further, this absence of corrosion due to CO_2 seems a logical result of the relatively low temperatures and pressures attendant to the operation. A most convincing proof of this conclusion may be seen in reports of using CO_2 with injection water, where slight scaling but no corrosion has been observed.

Literature Disappointing

The literature summary revealed little usable information concerning primary causes of water-flood corrosion. Similarly, all of the factors possibly contributing to corrosion rate have been lightly treated. Many chemical and physical elements or conditions are said to have various effects, but specific examples or satisfactory proof of the relationships are not furnished.

The time is now here for an honest statement of what we know to be true. The brevity of the list of proven causes shows beyond question that a great deal of work yet remains to be done.

Substantiation of only a few points constitutes progress. To this end, a few pertinent questions were sent to 24 men believed to be best fitted to provide positive answers. These questions and answers are given in Table 1.

Note on Question 1 that oxygen and H_2S are believed to be approximately equal as primary causes of water-flood corrosion. Bacteria apparently ranks third and CO_2 fourth. Other causes received so little mention that they are considered to be exceptional cases.

Of the 682 floods observed (Question 2) 26% were found to have serious corrosion. The observed causes of this serious corrosion have only a general resemblance to the causes listed in Question 1. Oxygen, H_2S, and bacteria are stated in order, followed by several other causes. It is noteworthy that combinations of one or more causes are mentioned three times.

It is shown by the replies to Question 3 that the vote is rather heavily against CO_2 as a direct cause of water-flood corrosion. The number favoring CO_2 as an indirect cause may lend some credence to the many published statements concerning the role of CO_2. However, any conclusions to this effect should be tempered by the fact that three replies emphasized that any influence of CO_2 is not susceptible to convincing evidence. Further, the three men pointing out the uncertain status of CO_2 have outstanding experience and recognition in the field of corrosion due to water.

There is a rather well-defined geographic relationship in the answers received. For example, replies from the Permian basin area mentioned the importance of "native" H_2S. Comments from other areas stressed different causes such as O_2 and H_2S from bacterial activity. This geographic relationship is believed to explain to some degree the absence of general agreement shown in the literature and in the results of the questionnaire.

Flood Case Histories

The results of the questionnaire on water-flood corrosion do not reflect the author's views. Two water-flood case histories will best serve to illustrate some important corrosion phenomena.

Permian basin flood. This flood uses brackish supply water of relatively high H_2S content. Treatment in an open system removes the sulfide to a level of a few p.p.m. Thus, the injection water usually carries detectable H_2S and at times traces of oxygen as well. Injection lines

were new 2-in. line pipe, installed without coating. When this flood had been in operation 30 months the injection lines were found to be internally coated with a hard deposit approximately ½ in. in thickness, as shown in photo.

This deposit consisted of about equal portions of calcium carbonate and calcium sulfate, with sufficient iron sulfide to make it black in color. At this period the line leaks averaged 2.5 per month per injection well. The leaks were due to pitting attack underneath the thick scale deposit. The pits were invariably filled with iron sulfide corrosion product at all stages up to complete perforation.

The rapid progress of these active pits produced steep-sided holes, as evidenced by the method of repair which consisted of driving punches and welding around them. Both total bacteria and SO_4 — reducer counts were known to be quite high for several months prior to the high leak incidence. Clearly, the thick scale deposit did not protect the pipe but had the opposite effect of protecting colony growths of hydrogen-consuming, H_2S-producing bacteria and the simultaneous development of galvanic corrosion cells.

Illinois flood. Operation at this flood illustrates essential absence of corrosion under two different conditions formerly believed to insure rapid corrosion attack.

Phase 1: The flood was operated for 3 years using a combination of low-pH supply water and produced brine containing H_2S. The supply-water pH averaged 6.0 and a separator was used to release some of this gas to prevent gas locking the injection pump. Produced brine contained 12 p.p.m. H_2S which was partially released in an open pit before mixing with supply water. The composite injection water had pH of 6.5 and H_2S of 6-10 p.p.m.

No corrosion failures occurred in 3 years of operation under these conditions. It was observed that the uncoated injection lines were internally covered with a thin, even, and impervious layer of soft deposit which was mainly iron sulfide. Obviously, the initial corrosion attack was stifled rather quickly as the deposit became protective.

Bacteria counts were low throughout the period. Results at this flood show that injection water having H_2S and low pH, due to CO_2, does not necessarily produce serious corrosion.

Phase 2: Operation was altered so that only the low-pH supply water is now used for injection. As before, excess CO_2 is partially released in a separator but pH of the injection water averages 6.3. Oxygen and H_2S are now absent. Operation under these conditions for 16 months has exhibited only one failure directly attributable to corrosion. This failure was in the suction line rather than on the pressure side.

Again, bacteria counts have remained low and scale or slime accumulation is noted. There is some indication that the thin sulfide coating is slowly disappearing. Certainly, no product of CO_2 attack may be observed.

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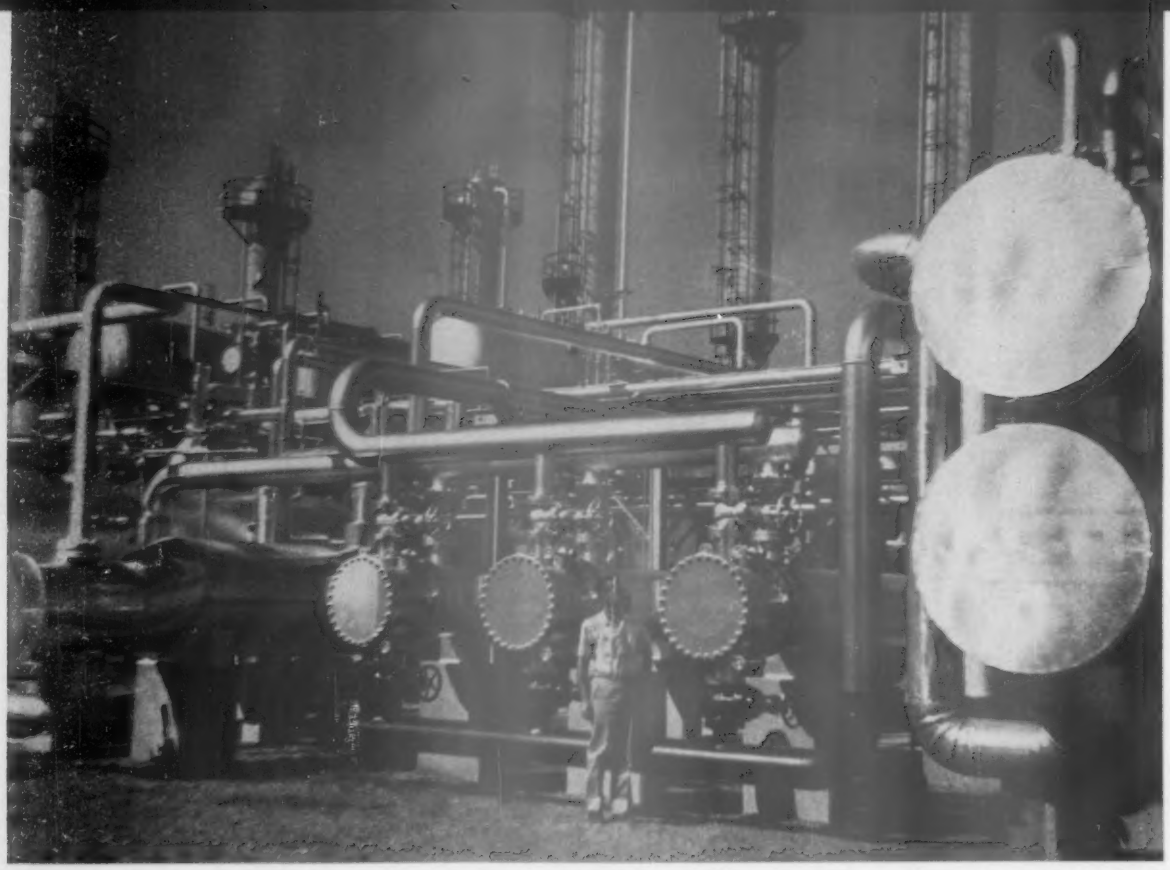


FINAL INSPECTION is made in the new lean-oil refrigeration facilities of refrigerant condensers (center) and chillers (right).

Shell expands Sheridan plant

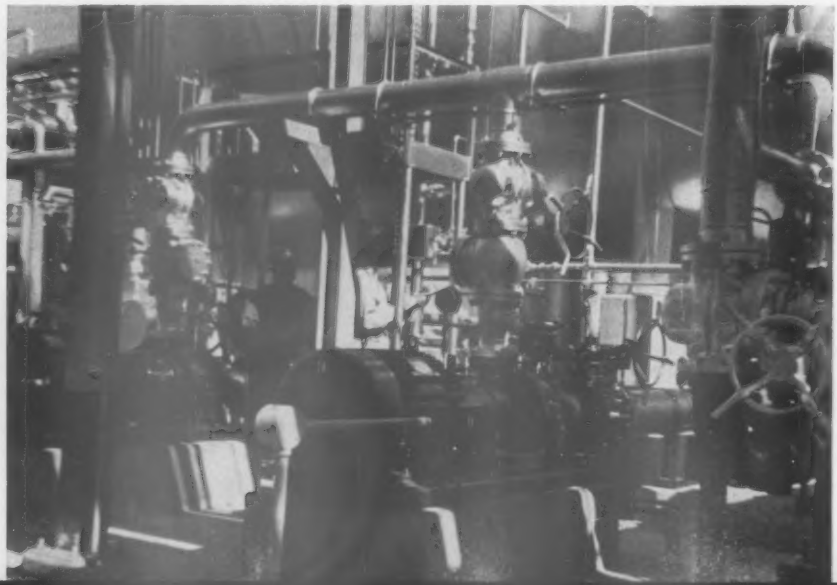
BY H. C. BOZEMAN
Gulf Coast Refining Editor

A TWO-PHASE PROGRAM which raises capacity from 100 million to 150 million cubic feet daily at its Sheridan, Tex., cycling plant has been completed by Shell Oil Co.

One phase was to install at the plant 1,200 tons of refrigeration capacity and additional absorption facilities. The other phase was additional field gathering facilities at the north end of Sheridan field. The expansion program was started in March.

The new equipment is expected over a 20-year equipment life to increase volatiles production by an average of about 2,100 bbl. daily. The plant can operate at reduced pressures and temperatures for optimum volatiles production with the new absorption and refrigeration equipment.

NEW ABSORBER (small photo) is 63 ft. tall, weighs 95 tons. In large photo, operators inspect the new lean-oil booster pumps and free-water coalescer vessel.



How different pump types work

BY JOSEPH ZABA

FOR CONVENIENCE of discussion sucker-rod pumps will be divided into two groups, the tubing and the rod pumps, referred to also as insert pumps. Components common to both types may be first considered with later discussion of the two groups of pumps.

Pump plungers. All plungers used in sucker-rod pumps may be divided into two groups, the soft-packed and the metallic plungers.[1 2] Soft-packed plungers may be cup, ring, or repack type. Metallic plungers may be one-piece or sectional.

Cup plungers consist of a series of bowl-shaped rubber-fabric elements assembled on a mandrel. The cups are arranged facing in the direction of the pressure on the upstroke of the plunger. As the plunger moves upward the fluid pressure expands the lips of the cups against the barrel, forming the seal. On the downstroke the pressure on the cups is decreased, permitting the free downward movement of the plunger.

Cup plungers are widely used for shallow to moderately deep pumping, probably not in excess of 4,000 or 5,000 ft. with number, fit, and hardness of the cups varying with the depth of the application. Soft cups are used for very shallow pumping, medium cups to around 2,500 ft. and hard cups below this depth. Cup type of plungers are not well adapted for handling fluids containing sand. The cups themselves are susceptible to damage by sand, and the sand may become imbedded in the cups, damaging the barrel.

The ring type of plunger is equipped with a series of fabric and rubber rings which are installed in the grooves of the plunger. The seal of this type of a plunger does not depend on fluid pressure, but is a result of the swelling of the rings. Because of this, the fit of the plunger must be carefully selected. Rings which are too tight may substantially increase friction losses. Plunger which is too loose may bring about leakage. Ring type of plungers are used frequently in wells handling large volumes of water. If properly fitted they can handle some sand. However, imbedding of sand in the rings would tend to damage the barrel.

Repack type of plungers are equipped with a coil of packing, flax, and tallow and slidable mounted cups. On the upstroke the pressure exerted on the cups is transferred to the packing coil forming a seal between the plunger and the barrel. These plungers are used only for moderate pumping depths, and are not well adapted for handling large volumes of water. They can handle sand, but the barrel can be damaged, if the sand becomes imbedded in the packing.

Metallic plungers depend for seal on fluid friction developed between the plunger and the barrel. The question of leakage past a metallic plunger has been already discussed in Part 26 of this series.

The one-piece metallic plungers are made of a variety of materials. Particular attention is devoted in their manufacture to the concentricity of threads and outside diameter of the plunger, to the squareness of faces and threads and to the fit tolerances and condition of the surface of the plunger. Chromium-plated plungers are widely used, particularly in cases of fluids containing abrasives.

Sectional metallic plungers consist of a series of short sections which are assembled on a mandrel. They are generally made from materials which do not have enough strength to form a one-piece plunger, such as cast iron. An important requirement for good performance of this type of plunger is perfect alignment of the sections.

Different variations and combinations of the above-mentioned basic types of plungers are available and used.

Pump barrels. Pump barrels can be divided into three groups: (1) common working barrels made out of steel, cast-iron, or corrosion-resisting alloys, (2) full liner working barrel consisting of a steel jacket with a one-piece cast-iron or corrosion-resisting alloy liner and (3) the so-called sectional liner barrels. Such barrels consist of an outside steel jacket with short (usually 12 in. long) machined liners placed end to end inside the jacket and held in place by the collars of the jacket.

A variety of materials and methods of finishing are used in manufacture of pump barrels depending on the type of well conditions expected.[1] The well conditions which have to be especially taken into consideration are the degree of corrosiveness of the fluid to be handled and the amount of abrasive material in the fluid. As far as full barrel pumps are concerned there are certain limitations regarding the selection of materials which can be used because of possible difficulties in drawing, heat treating, and finishing of long tubes. If a soft-packed plunger is used, the prime requirement is the smoothness of the barrel surface because surface imperfections would tend to damage the packing element. In case of metallic plungers, size and straightness of the tube must be kept to very close tolerances. Sectional liners permit use of practically unlimited variety of materials. The main problem with this type of liner is perfect alignment of the liner sections.

Pump valves. Over the years many different designs of pump valves have been tried, but the ball and seat type valves still remain as those almost universally used. Valves are made of a variety of materials to withstand corrosion, erosion, and damaging effects of impact. Particularly severe conditions imposed on the pump valves are those resulting from the heading action of the well. The fluid passing through the valves with high velocity imparts a spin to the ball, with the resulting rapid wear of the ball guides. The improperly guided ball leads to ball, seat, or cage failures.

Tubing pumps. To this group belong pumps with the barrel an integral part of the tubing string. The barrel is installed on the bottom of the tubing string and is run into the well on the tubing. The plunger assembly is lowered into the barrel on sucker rods. The standing valve assembly is usually of the removable type. The bottom of the plunger is equipped with one of several devices, such as a J-tool, which permits engaging the valve assembly and pulling it out on the rods.

The tubing pump is simple and ruggedly built. It makes possible the use of a larger plunger size for any given tubing size than is the case with a rod pump. Its disadvantages are that the tubing must be pulled to replace the worn barrel and the pos-

sibility of damage to the plunger when it is lowered into the well.

To assure uniform wear of the barrel—or in case of subsurface scaling—a pump with an extension nipple on the bottom of the barrel may be used (Fig. 35-b, Part 29). This makes possible stroking of the plunger out of the bottom of the barrel. This arrangement is not satisfactory for gas-interference conditions because of increased clearance space.

Rod pumps. In rod pumps, the barrel, plunger, and standing valve are assembled at the surface and lowered into the well as a unit. The rod pumps have an obvious advantage of reducing the time needed for servicing. Also, the highly machined parts of the pump are protected during installation. However, for any size of tubing the plunger of a rod pump is smaller than that of a tubing pump.

When the pump is lowered to its pumping position, the pump must be locked to the tubing to permit relative motion between the plunger and the barrel. This is accomplished by the use of holddowns which may be of the cup or mechanical type.

The cups of a cup holddown are of the same type as plunger cups, except that they are oversize. They are forced into the seating shoe which is installed in the tubing at the desired elevation. The mechanical holddown depends on a metal-to-metal seal on a tapered surface. Locking of special spring fingers holds the two surfaces together. Devices are also available which permit anchoring and packing off a pump in the tubing at any desired point when the seating shoe has not been provided. Rod pumps are divided into top and bottom holddown types.

The holddown of a top holddown pump is located as shown in Fig. 35-c, Part 29. The pump passes through the seating shoe and is suspended from it by the holddown. This type of pump is well adapted for handling fluid containing sand because the fluid is discharged immediately above the holddown and the turbulence at this point prevents settling of the sand. Also, the sand cannot work its way between the pump and the tubing. In case of gas interference the gas anchor may be shortened or eliminated by placing the perforated nipple of the mud anchor immediately below the seating shoe.[3] This reduces the pressure drop in the suction system of the pump, reducing the evolution of gas. The arrangement would not be satisfactory for corrosive fluid because the turbulence in the pump-mud anchor annulus would tend to increase the corrosive action on the outside portion of the pump.

The top holddown pump is not adapted for deep-well pumping because of pressure differential across the wall of the barrel, the inside of the barrel being exposed to pressure of the full column of fluid and the outside to the pressure of submergence. The resulting breathing of the barrel during the pumping cycle tends to increase the clearance between the plunger and the barrel thus increasing the slippage of fluid past the plunger.

The bottom holddown pump depends on the holddown at the bottom of the pump to lock it against the tubing. The pump is well adapted for deep pumping because both sides of the barrel are exposed to the pressure of the column of fluid. It is not satisfactory for handling fluid containing sand because sand would tend to settle between the barrel and the tubing, sticking the pump. Arrangements are available, however, which permit sealing the top of the pump, thus preventing the sand from settling in the tubing-pump annulus. For gas conditions this type of pump must be equipped with an efficient gas anchor.

Rod pumps are further divided into standing barrel and traveling barrel pumps. In standing barrel pumps the barrel is stationary and the plunger is reciprocated by the rods. In traveling barrel pumps the plunger is attached to the holddown by the so-called pull tube (Fig. 35-e, Part 29). The standing valve is located on the top of the plunger and the traveling valve on the top of the barrel. The rods, attached to the traveling valve, reciprocate the barrel over the plunger.

The traveling barrel is very well adapted for handling fluid with sand because the turbulence caused by motion of the barrel prevents the sand from settling between the tubing and the pump. Since both sides of the barrel are exposed to the full fluid-column pressure it can be used for deep pumping. The pump is not efficient for gas conditions because of considerable pressure drop within the pull tube and across the standing valve which is necessarily small. Mechanically, the pull tube is subjected to bending and is the vulnerable portion of the pump.

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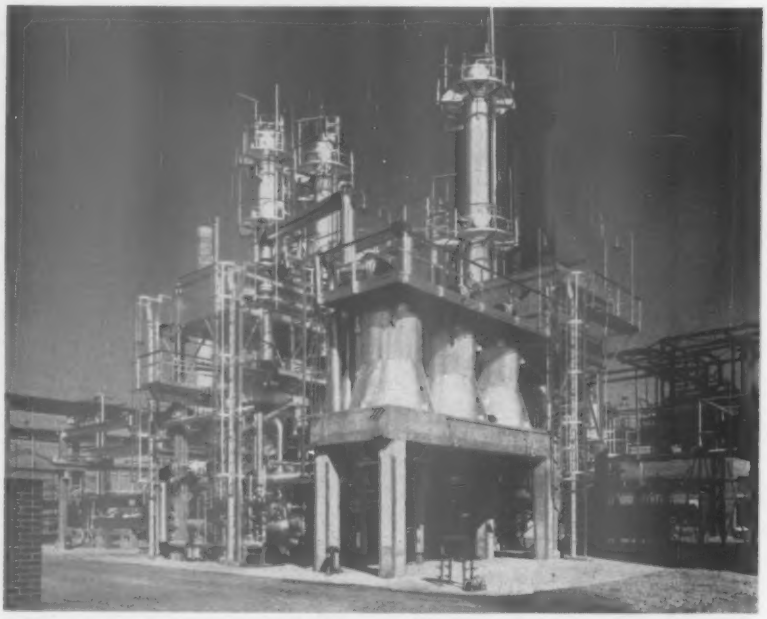

This fractionator is part of the new equipment at Gulf Oil Corp.'s Port Arthur, Tex., refinery where the ethylene units have been modified to make high-purity ethylene. Design was based on research and operating data from the existing facilities. Gulf reports that its ethylene has the highest purity available commercially.

WHEN CASING MUST BE CENTERED

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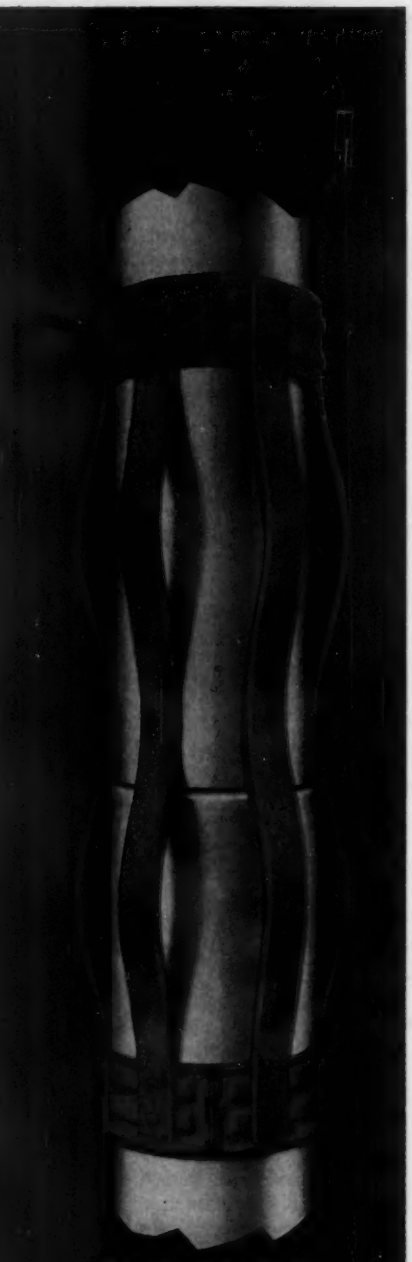

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CHROMATE, in varying concentrations, was used as a corrosion inhibitor in approximately 36% of the cooling-tower waters examined. Chromate concentrations in excess of 60 p.p.m. also act as a deterrent to the growth of many forms of algae.

A microbiologist explains:

Here's what grows in cooling-tower water

BY EDWARD TEHLE, JR.
Dearborn Chemical Co.

AN IDEAL environment exists in open recirculating cooling systems for microbiological growths of many types, creating associated problems of corrosion, plugging of pipes and screens, interference with heat transfer, and attack of wood. The most frequent encountered microorganisms are algae. Despite the seasonal nature of the fouling problems caused by algae, in most areas of the United States the problem is perennial and one of increasing concern.

During a 2-year period, a careful record was maintained of the predominant algae found in water samples from recirculating cooling towers located throughout the U. S. In addition, particular note was made of the algae occurring in chromate-containing waters and waters of a wide pH range.

The study showed that a number of algae and diatoms exist in cooling waters containing chromate concentrations as high as 60 p.p.m., and three varieties were found in waters containing as much as 120 p.p.m. chromate. The majority of the algae were isolated from waters near a neutral pH of 6.0 to 7.9. One variety was also found in mildly alkaline waters of 8.0 to 9.5 pH.

Among the organic algicides most frequently used in cooling-tower water are phenates, quaternaries, and amines. The algicide dosage requirements vary depending upon the severity of the algal growths.

Water samples for study were submitted in polyethylene or glass containers. Whenever possible, a moist scraping of an algal deposit from the tower basin, slats, or fill was included with the sample. The algae identified in the deposit were considered, along with those found in the water sample, as the flora of the tower.

The waters that contained prolific growths were subjected to a direct examination. Those not containing obvious growths were concentrated using the Sedgewick-Rafter filter or a centrifuge. All samples were examined under the low (100X) and high (400X) powers of a microscope.

Palmer,[2] Smith,[17] Tiffany and Britton,[18] and Prescott,[19] were used as guides in the identification of the genera of the algae isolated.

With the exception of a few towers, where chlorine or hypochlorites may have been used intermittently, samples were collected from towers that were not treated with algistrats or algaecides. Therefore, the algae identified can be assumed to represent the normal flora of the tower and not resistant or tolerant forms.

Included in the analysis was a determination of the chromate concentration, by the iodometric method, and a measurement of the pH of each water sample. These measurements were included to determine the effect of varied chromate concentrations and pH on the nature of the algae isolated.

Identification and occurrence. The genera and frequency of the algae found in the samples analyzed are listed in Table 1.

There were 13 types of green algae found in the cooling tower waters. The most frequently occurring were the unicellular forms Chlorella and Scenedesmus, and the filamentous Ulothrix. They were found in 28%, 14%, and 24% of the towers, respectively. The remaining 10 genera were found in 2% to 6% of the tower waters examined.

Despite the fact that only a few genera of blue-green algae occurred

TABLE 1 — INCIDENCE OF VARIOUS ALGAE IN RECIRCULATING COOLING-TOWER WATERS

Algae—	Per cent of cooling towers containing algae
Chlorophyceae (green)	
Ankistrodesmus	6
Agmenellum	2
Chlamydomonas	2
Chlorococcum	2
Chlorella	28
Coelastrum	2
Palmella	6
Phytoconis	4
Scenedesmus	14
Spirogyra	2
Stigeoclonium	2
Ulothrix	24
Zygnema	2
Myxophyceae (blue-green)	
Oscillatoria	30
Anabaena	8
Anacystis	12
Bacillariophyceae (diatoms)	
Asterionella	6
Cyclotella	8
Diatoma	8
Fragillaria	16
Melosira	24
Navicula	12
Nitzschia	4
Synedra	2

in cooling-tower waters, Oscillatoria, a filamentous blue-green alga, was found in 30% of the towers. The data in Table 1 indicate that Oscillatoria was the most prevalent of all the algae isolated. In many towers, approximately 26%, Oscillatoria was the dominant alga.

Myers[20] reported that heavy growths of Oscillatoria were the cause of corrosion occurring in open steel tanks. The high incidence of Oscillatoria in cooling-tower waters would warrant the development of a specific algaecide for the control of this blue-green alga.

Anabaena and Anacystis were the only other genera of blue-green algae isolated and appeared in 8% and 12% of the towers.

The predominant diatoms were Melosira, Fragillaria and Navicula, appearing in 24%, 16%, and 12% of the towers. The remaining 5 genera, noted in Table 1, were found in 2% to 8% of the tower waters.

Approximately 36% of the cooling-tower waters examined contained chromate, in varying concentrations, as a corrosion inhibitor. Table 2 shows that several genera of green and blue-green algae, and diatoms are able to tolerate a wide range of chromate concentrations. However, it is apparent that concentrations of chromate exceeding 60 p.p.m. are a deterrent to the growth of a number of algae.

It is interesting to note that Oscillatoria and Ulothrix were found in cooling waters containing 120 p.p.m. chromate. Both of these algae are among those most frequently encountered in cooling towers. Generally, the green algae and diatoms appear to be the most prevalent in chromate-containing waters.

According to Palmer,[2] the majority of algae grow at or near a neutral pH, though some blue-green algae may grow best in water of a high pH. The data in Table 3 support this fact since the majority of the cooling-tower algae were isolated from waters in the pH range of 6.0 to 7.9. Oscillatoria was found in mildly alkaline waters of 9.0 to 9.5 pH, in addition to occurring at a pH range of 6.0 to 6.9.

TABLE 2 — ALGAE OCCURRING IN CHROMATE-CONTAINING COOLING-TOWER WATERS

Chromate concentration range (p.p.m.)	Algae
1-39	Agmenellum, Ankistrodesmus, Anabaena, Cyclotella, Melosira, Navicula, Oscillatoria, Palmella, Stigeoclonium, Ulothrix.
40-60	Anacystis, Ankistrodesmus, Asterionella, Chlorella, Fragillaria, Melosira, Oscillatoria, Scenedesmus, Ulothrix, Zygnema.
120	Diatoma, Oscillatoria, Ulothrix.

TABLE 3—ALGAE OCCURRING IN COOLING-TOWER WATERS OF VARYING pH

pH Range	Algae
5.5-5.9	Chlorella, Cyclotella.
6.0-6.9	Anacystis, Ankistrodesmus, Asterionella, Chlorella, Cyclotella, Diatoma, Fragillaria, Melosira, Navicula, Oscillatoria, Palmella, Scenedesmus, Stigeoclonium, Ulothrix, Zygnema.
7.0-7.9	Anabaena, Anacystis, Asterionella, Chlamydomonas, Chlorella, Coelastrum, Cyclotella, Melosira, Navicula, Oscillatoria, Protococcus, Scenedesmus, Synedra.
8.0-8.9	Agmenellum, Anabaena, Asterionella, Cyclotella, Fragillaria, Melosira, Oscillatoria, Ulothrix.
9.0-9.5	Oscillatoria.

According to Palmer,[2] the majority of algae grow at or near a neutral pH, though some blue-green algae may grow best in water of a high pH. The data in Table 3 support this fact since the majority of the cooling-tower algae were isolated from waters in the pH range of 6.0 to 7.9. Oscillatoria was found in mildly alkaline waters of 9.0 to 9.5 pH, in addition to occurring at a pH range of 6.0 to 6.9.

Algae control. Copper sulfate, chlorine, chloramines, and hypochlorites have been used to control algal growths in recirculating cooling-tower water. However, in many systems the use of these chemicals is not desirable because of the injurious side-effects that they might produce.

During the past 10 years, significant advances have been made in the development of new algicides for use in cooling towers. Palmer[21] briefly discusses some of the chemicals that are being evaluated or used in water supplies; namely,

TABLE 4—ORGANIC ALGICIDES CURRENTLY BEING USED IN RECIRCULATING COOLING-TOWER WATER

Chemical name—	Dose range* (p.p.m.)
Sodium pentachlorophenate	40-60
Sodium pentachlorophenate + sodium trichlorophenate mixture	20-40
Rosin amine D acetate	10-20
Alkenyldimethylethylammonium halides	40-50
Alkyldimethylbenzylammonium chlorides	30-40
Alkyldimethylbenzylammonium chlorides + alkyldimethylethylbenzylammonium chlorides mixture	20-30
Alkylarylmethyltrimethylammonium chlorides	30-40
Alkyltrimethylammonium chlorides	40-50
Dialkyldimethylammonium chlorides	40-50
Alkyl-1,3-propylenediamine acetate	20-30

*Based upon 100% active ingredient.

quaternary ammonium compounds, rosin amine derivatives, quinones, chlorophenates, urea derivatives, activated silver compounds and organo-metallics. With a few exceptions, the success of these materials as algicides in cooling towers has not been reported in the literature.

Table 4 notes the chemicals and dose ranges of the algicides currently being used in cooling towers. The dose ranges given represent minimum lethal shock concentrations and necessarily must be adjusted to control specific biofouling problems as they occur.

Conclusions. The algae most prevalent in open recirculating cooling-tower water, and probably causing the majority of the biofouling problems, were, in order of prevalence: Oscillatoria, a filamentous blue-green, Chlorella, a unicellular green, Ulothrix, a filamentous green, Melosira, a filamentous diatom, Fragillaria, a diatom, and the green alga Scenedesmus. With the exception of Scenedesmus, all of the algae were found in at least 15% to 30% of the tower waters examined.

Acknowledgment

The author wishes to thank Miss L. L. McAninch, librarian, Dearborn Chemical Co., for conducting an extensive literature search.

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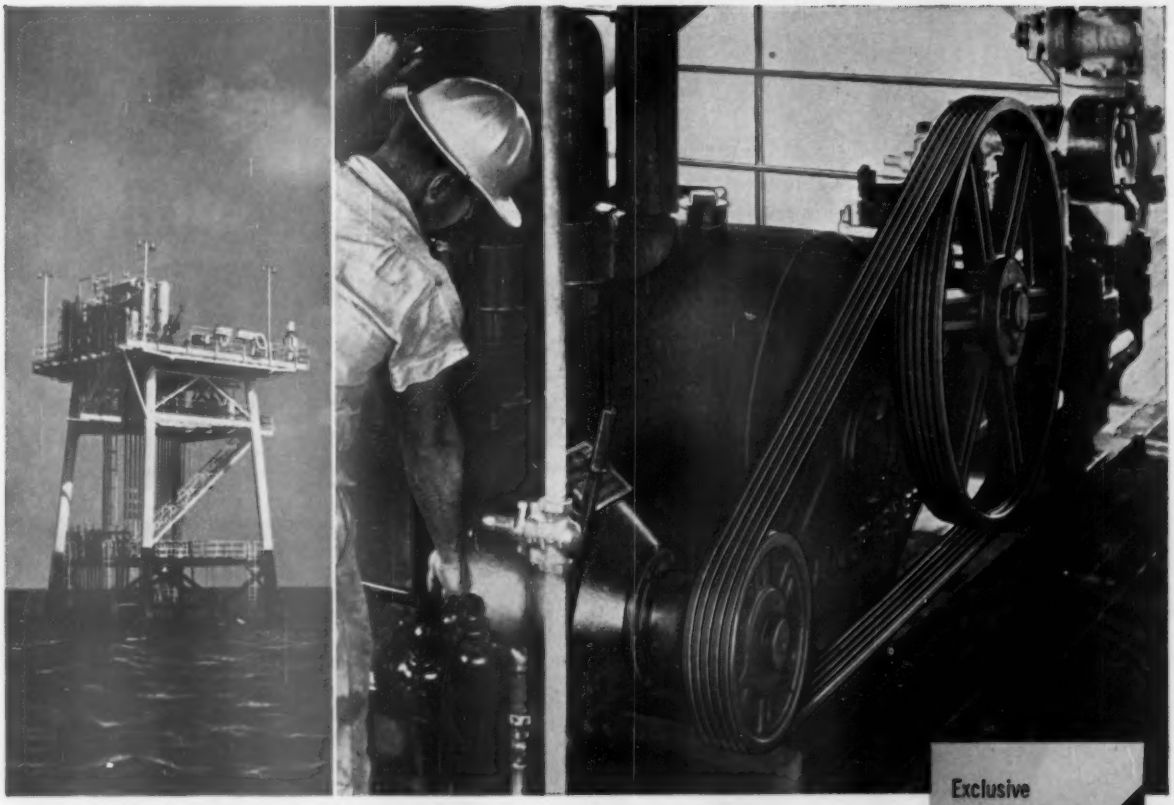
Ohio compressor station gets four new intake filters

MAINTENANCE crews swing a hoist into action during the overhaul of one of the four air intake filters at Texas Eastern Transmission Corp.'s Athens Ohio, compressor station. The filter, a moving metal curtain, traps on its oiled surfaces the airborne lint, pollen, and other matter as the air is drawn into the gas turbine. The metal curtain dips into an oil bath at the bottom of the filter case during the course of its belt conveyorlike movement.

Clean air is compressed by the turbine's axial flow compressor and sent to the preheater (at the base of the exhaust stack behind the hoist) for preheating by the turbine's hot exhaust gases. The heated air enters the combustion chambers where it mixes with natural gas, is burned, and then turns the turbine wheels that power the gas-transmission compressor.



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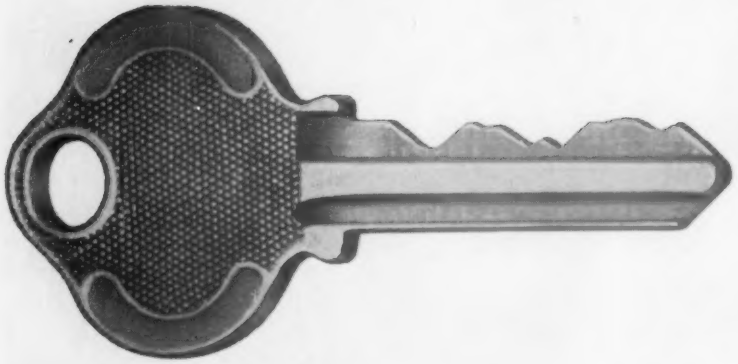
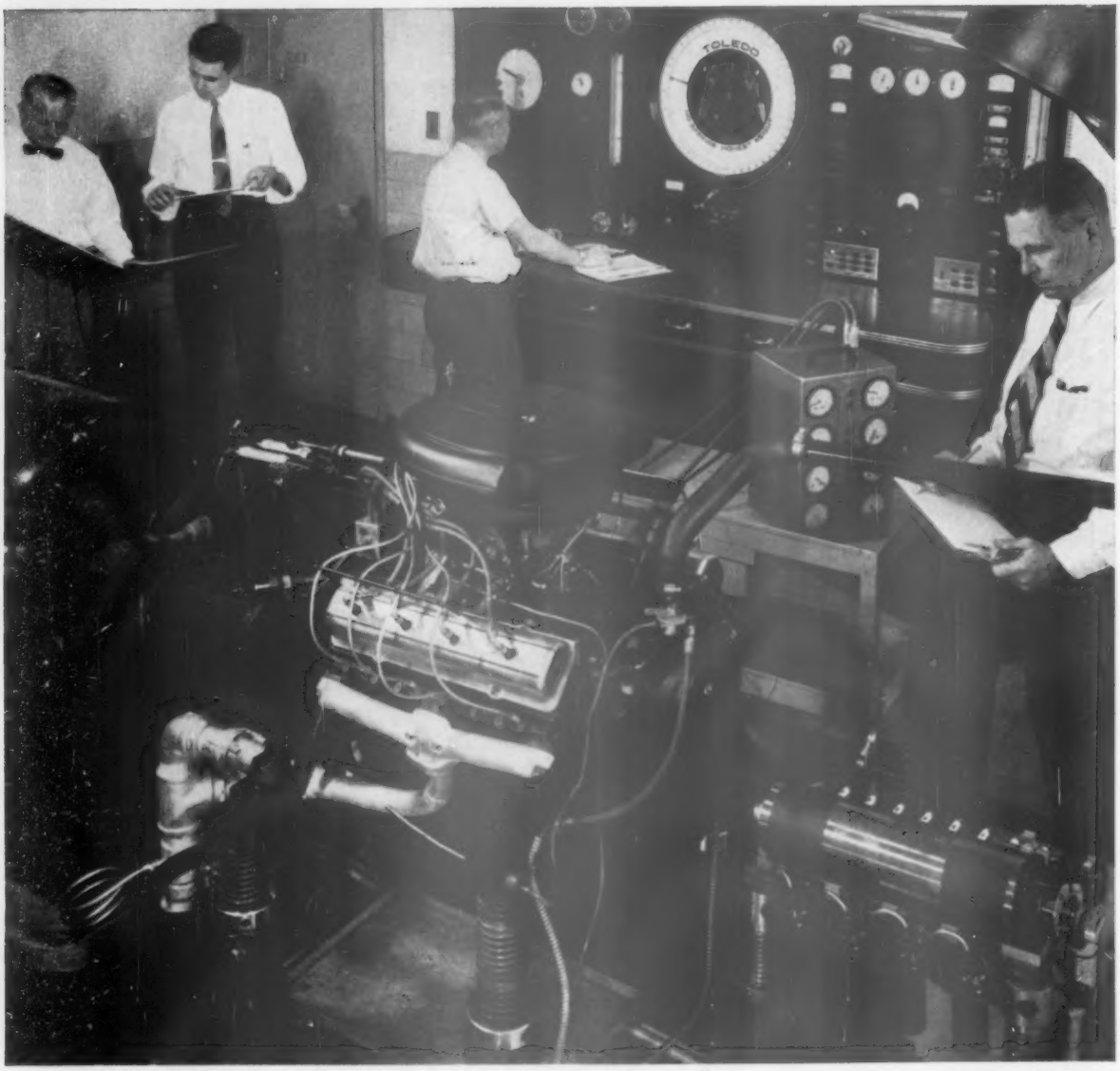


COMPONENT ALLOCATION— A KEY TO BETTER ROAD PERFORMANCE



Ethyl-developed instrumentation and equipment used in studies of deposit effects.

SELECTING gasoline components and matching them with the multiple choice of antiknocks now available presents the refiner with a complex but rewarding situation. It can, in many cases, produce octane numbers at low cost or it can give a better road performing fuel at the same octane level.

For example, the substitution of paraffinic base stocks for aromatic stocks, while using increased TEL content to control octane level, can provide the refiner with a gasoline having superior road octane number. With lower aromatics he also gets better deposit effect characteristics.

Utilization of higher TEL concentrations makes the use of straight-run naphthas and natural gasolines particularly attractive to refiners who blend their premium gasoline almost entirely from light cracked stock and heavy reformate. Such gasolines are highly aromatic and extremely sensitive. The lower octane paraffins found in the straight-run and natural gasoline components are insensitive and very responsive to TEL.

Adding TEL and replacing all or part of the cracked stocks not only will decrease sensitivity and improve Road octane, but will permit less severe reforming. Reducing reformer severity produces less aromatics, more paraffins, better TEL response, and lower blend sensitivity. In contrast, severe reforming and resulting highly aromatic stocks may cause deposit problems in high compression engines.

TEST RESULTS

Deposit effect tests on two gasolines—one high in TEL, low in aromatics (Fuel A)—the other low in TEL, high in aromatics (Fuel B)—were run in a passenger car engine at 11-to-1 compression ratio under city-suburban driving conditions. The test fuels had similar volatilities, sulfur contents, and were reasonably close in laboratory octane numbers—the high-TEL fuel having the characteristic lower sensitivity.

	FUEL A	FUEL B
TEL content, ml/gal.	4	2
% aromatics	24	40
% olefins	11	5
Theories of phosphorus	0.3	0.3
Research octane number	102.0	102.8
Motor octane number	93.5	92.3
Stabilized octane number requirement*	102.0	103.0
Octane number requirement increase	3.5	4.1
Surface ignition*, number of counts per hour	0.5	6.2
Rumble occurrence, % of accelerations	0	80

*CRC reference fuels

Notice that after deposits had stabilized, the engine run on Fuel A had lower octane requirement, less octane requirement increase, and fewer occurrences of surface ignition and rumble.

REMINDERS TO REFINERS

Antiknocks are your best octane improvement buy, whether costs are figured on Research, Motor or Road ratings.

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The FOREMAN'S PAGE

Here are three . . .

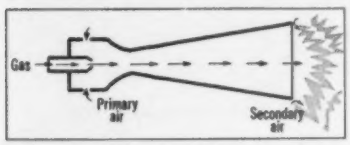
Types of refinery burners

BECAUSE the gas burner does not prepare the fuel, but only proportions and mixes it, most gas burners differ only in the way that the air and fuel mix. Gas burners may be subdivided into two general types:

1. Some burners premix a portion or all of the necessary combustion air with gas in the burner, or upstream of the burner in other equipment, before release.

2. Other burners do all air and gas mixing in the furnace, external to the burner assembly.

In most industrial burners, atmospheric air is aspirated into the burner by the action of a gas jet located in a venturi tube (Fig. 2).



BURNERS are of two main types. Internal-mix burner, shown here, is the most widely used. Air and oil are mixed in a chamber within the burner and come out in a single stream. Fig. 2.

Air that is premixed in the burner is known as primary or premix air; the remaining combustion air, admitted externally to the burner, is the secondary air. The amount of premix or primary air may range up to 100% of the combustion air required.

Primary air is regulated by shutters. Where gas pressure is low, the burner must be carefully proportioned to conserve the relatively small amount of energy in the gas stream which entrains the primary air. The velocity of the air-gas mixture must also exceed the speed of burning, or flame-propagation rate, to avoid flame flashbacks.

With burner-port size and shape fixed, the nature of the burning depends largely on the amount of primary air. Primary air is usually maximized with a resultant short and relatively nonluminous flame.

Oil burners. In addition to proportioning and mixing fuel and air, oil burners must atomize the fuel. This may be accomplished by:

1. Tearing the oil film into drops by centrifugal force,

2. Forcing oil under pressure through a suitable nozzle, and

3. Using high-pressure steam or air to break the oil into droplets.

There are many types of fuel-oil burners. Of these, two of the most common are the steam-atomizing burner and the high-pressure-air-atomizing burner. Both work on the same principle and are often used interchangeably.

These burners can handle practically any liquid fuel as long as the proper oil temperature is maintained to give the proper viscosity at the burner tip. Unlike some other types they do not require clean oil. If they do plug because of excess solid particles, the burners can be changed in several minutes.

A cross-section of an internal-mix steam-atomizing burner is shown in Fig. 3.

Steam and oil are admitted through the back of the burner assembly into chambers E and A respectively.

Oil travels down the inner concentric pipe B to core C where it is sprayed through orifice D into the mixing chamber G.

Steam, after passing down the annular space between the oil pipe and the outside barrel, is forced through the holes F. Turbulence caused by the steam thoroughly emulsifies the mixture of oil and steam. The emulsion then passes at high velocity through the throat of chamber G to the burner tip.

Holes J in the tip atomize and spray the oil into the furnace at an angle of 30° for inside burners and 20° for outside burners. This reduces flame impingement on the walls.

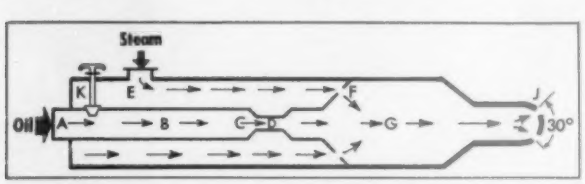
The burner is equipped with a steam-bypass valve K. After the oil-supply valve has been closed, this valve may be opened to allow steam to purge dirt or oil from the oil pipe.

Combination burners. A combination burner consists of two burners, the gas type shown in Fig. 2 and the oil type shown in Fig. 3, combined into one unit (Fig. 4). This burner makes furnace operation and fuel distribution more flexible because it can fire either gas or oil or both.

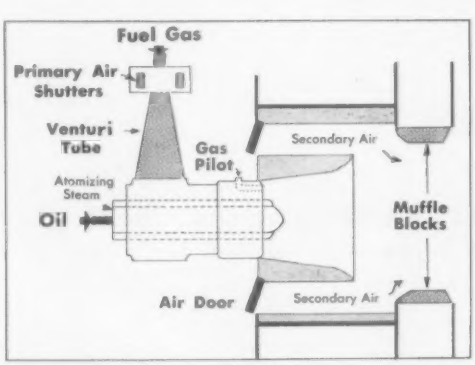
In a combination burner, the gas jet aspirates primary air. The gas-air mixture flows along the annular space between the oil-burner pipe and gas barrel. Secondary air is drawn through the air doors by the draft of the furnace and mixes with the gas-air mixture as the flame progresses in length.

The flame can be pushed upward or downward by adjustment to these doors. The flame starts within 6 in. of the burner tip and may extend as long as 10 ft., depending upon the furnace dimensions. The muffle blocks shown in Fig. 4 are necessary for correct flame characteristics, since they supply the intense heat needed for liquid-fuel vaporization.

Whenever oil is cut out of a burner, a small flow of steam should be maintained through the burner to prevent overheating of the burner tip. When burning all gas in a furname, a small flow of steam should be cut into all the oil burners.



INTERNAL-MIX steam-atomizing burners are widely used in refineries because they can handle almost any fuel. Fig. 3.



COMBINATION BURNER can fire gas, oil, or both simultaneously. Fig. 4.

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COMPLETE PROCESS INSTRUMENTATION

BY W. L. NELSON, Technical Editor and Petroleum Consultant

Light-oil treating—3

Miscellaneous operating costs

INSTALLATION COSTS of treating processes and the amounts of chemicals required (and their costs) have been discussed in earlier issues (Process Costimating No. 49, June 1, 1959, p. 180; No. 83, Nov. 14, 1960, p. 161; and No. 85, Dec. 12, 1960, p. 119). The magnitude of treating losses, labor, utilities, and maintenance costs are outlined here in Table 1.

All of these costs have been summarized in Table 2. Although operating costs can be compared in Table 2, the usefulness of the various processes is dependent more on the quality of the product than on the operating costs. Thus the more expensive caustic regenerative processes remove mercaptans and produce gasolines that are very susceptible to the action of TEL. This results in a saving in the cost of TEL that overshadows the operating cost of the processes.

Note that caustic washing as well as sweetening (or acid treating) is required and thus the cost of caustic prewash must be added to most of the operating costs of Table 2.

TABLE 1—APPROXIMATE LABOR, UTILITY, ETC., REQUIREMENTS OF LIGHT-OIL TREATING PROCESSES

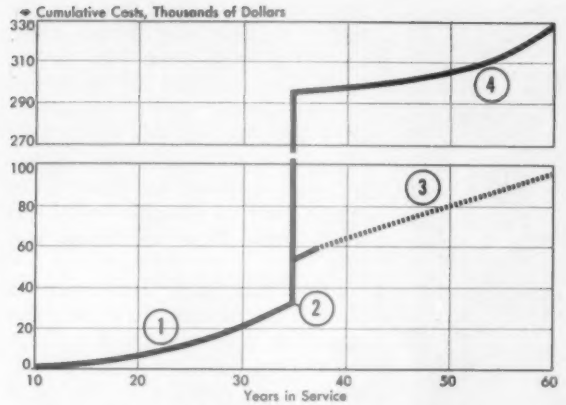
	Additive injection, TEL blending, clay)(or sand or salt) filters, inhibitor sweetening, or lead sulfide sweetening	Caustic wash or doctor sweetening	Caustic regeneration processes (steam, solution promoter, or methanol)	Copper chloride sweetening	Acid treating
Operating labor, men/shift					
Small plants	0.05-0.1	0.1-0.2	0.1-0.3	0.1-0.2	0.1-0.3
Major plants	0.1-0.2	0.3-0.5	0.4-0.8	0.3-0.5	0.3-1.0
Supervision	0.02-0.05	0.02-0.1	0.05-0.2	0.05-0.1	0.02-0.05
Laboratory testing*	*0.04-0.2	*0.1-0.2	*0.1-0.2	*0.1-0.2	*0.1-0.2
Maintenance, %/yr. of replacement	1-2	2-3	2.5-3.5	3-4	3-4
Electrical power, kw.-hr./bbl	†0-0.04	0.08-0.12	0.1-0.15	0.08-0.12	0.08-0.12
Steam, lb./bbl.	.....	.....	‡10-75	2-5	.....
Cooling water,§ gal./bbl.	.....	.....	50-300	.....	.....
Process water, gal./bbl.	.....	‖20-40	¶0-40	20-40	‖40-80
Loss (continuous processing), %	.....	0.05-0.1	¶0.05-0.2	0.05-0.15	0.5/lb. acid

*Ordinarily included as plant overhead rather than included in process operating costs.
†Only the power to pump through the equipment except in TEL blending (0.04) which often involves circulation.
‡Unisol process uses only 20-40 lb. steam/bbl.
§Assuming feeds are available at room temperature (that is, not warm).
¶Some plants include water washing.
‖Water washes have increasingly been replaced by electrical precipitation or by coalescer devices.

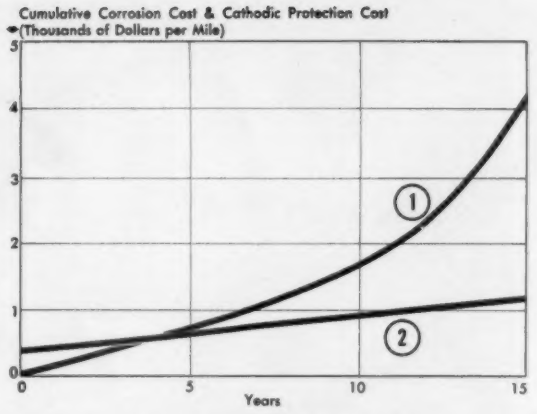
TABLE 2—APPROXIMATE OPERATING COSTS OF LIGHT OIL TREATING OPERATION, CENTS PER BBL. (1956).

	1956 Unit cost	Additive injection, TEL blending, clay (or sand or salt) filters, inhibitor sweetening or lead sulfide sweetening		Caustic wash or doctor sweetening		Caustic regeneration processes (steam, solution promoter, or methanol)		Copper chloride sweetening		Acid treating	
		10,000 B/D	1,000 B/D	10,000 B/D	2,000 B/D	10,000 B/D	2,000 B/D	10,000 B/D	1,000 B/D	10,000 B/D	1,000 B/D
Operating labor	*$3.12/hr.	0.11	0.56	0.30	1.12	0.45	0.75	0.30	0.56	0.49	1.50
Supervision	*$3.85/hr.	0.04	0.20	0.09	0.18	0.10	0.23	0.09	0.23	0.04	0.18
Maintenance†	Proc. Cost. No. 85	†0.03	†0.07	†0.10	†0.19	†0.29	†0.66	0.17	0.31	0.29	0.53
Electric power	0.75c/kw.-hr.	0.02	0.02	0.09	0.08	0.11	0.11	0.09	0.08	0.09	0.08
Steam	0.45-0.60c/M lb.	.....		.....		1.50	1.50	0.15	0.15	.....	
Cooling water	1.7c/M gal.	.....		.....		0.21	0.21	.....		.....	
Process water	0.10c/M gal.	.....		0.20	0.20	0.10	0.10	0.20	0.20	0.60	0.60
Subtotal		0.20	0.85	0.78	1.77	2.76	3.56	1.00	1.53	1.51	2.89
Misc. expenses & supplies	10-20%	0.10		0.20		0.30		0.22		0.30	
Direct cost excluding chemicals	.....	0.30	0.95	0.98	1.97	3.06	3.86	1.22	1.75	1.81	3.19
Chemicals	Proc. Cost. No. 83	varies		0.1-2.5		0.5-1.4		0.12-0.40		1.6-22.0	
Treating losses (continuous processing	.....	0.2		0.40		0.40		0.40		2-12	
Obsolescence, etc.† 10%/yr. replacement	.....	†0.21	†0.44	†0.39	†0.77	†0.96	†2.18	0.54	0.90	0.83	1.50
Laboratory testing	$3.12/hr.*	0.15	0.12	0.15	0.70	0.15	0.30	0.15	0.30	0.15	0.70
Other possible indirect costs	.....	0.56	0.76	0.94	1.87	1.51	2.88	1.09	1.60	2.98	14.20

*Average U. S. wages including 27% for all burdens.
†Ranges widely, depending on type of plant being considered.

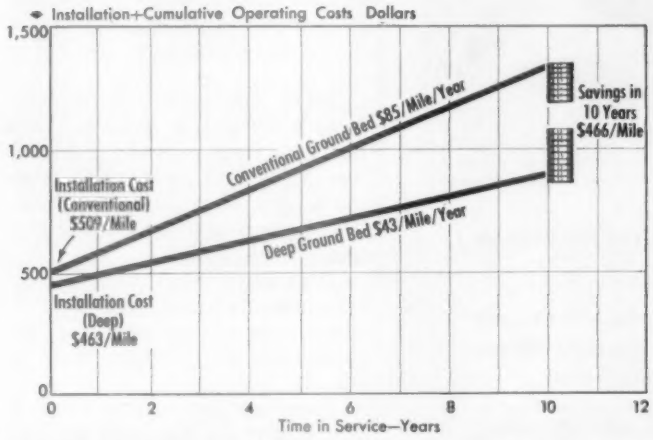


COMPARATIVE COSTS: Leaks (1), cathodic protection (3), and reconditioning (4). Protection was begun at (2). Fig. 1.

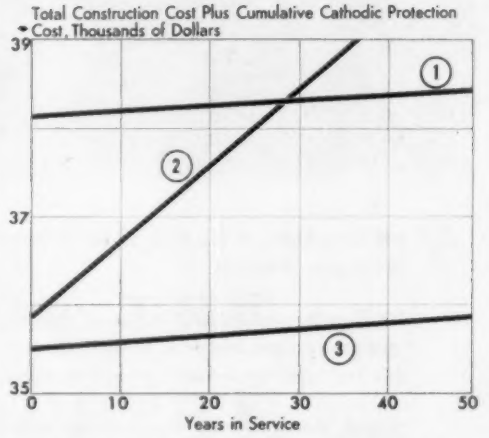


CUMULATIVE COSTS of protection (2) and the absence of protection (1) on bare 8-in. line. Fig. 2.

Finding management hard to sell on Cathodic protection?



DEEP GROUND BED can cut both installation and operating costs of protection in high-resistance soils. Fig. 3.



THIN-WALL, coated line (3) is less costly in construction and in cathodic protection and operation than coated (1) or bare (2) line. Fig. 4.

. . . here are some convincing figures that it pays off

BY FRANK A. THERRELL, JR.
Operations Engineer
Interstate Oil Pipe Line Co.
Shreveport

COSTS OF CORROSION and corrosion control are of paramount interest to industry. Studies are constantly being made to determine these factors for various fields. This article deals only with corrosion associated with crude-oil pipelines buried in earth.

Underground corrosion has many variables. This prevents any specific set of figures from being representative of corrosion cost and corrosion-control cost for pipelines in general. Figures in this article are based on some of the experience that Interstate Oil Pipe Line Co. has had in its 51 years of pipeline service.

Its purpose is to present a reasonable approach to calculating the over-all cost of corrosion on pipelines, the cost of controlling this corrosion, and recommendations for a corrosion-control program.

Presented at 1960 NACE South Central Region Conference, published in Corrosion, January 1961.

The problem. In most cases, galvanic action between pipeline steel and the earth is the major cause of corrosion on buried pipelines. This problem has been attacked in many ways. One of the chief methods, particularly in earlier years, was to design extra wall thickness into the pipe to allow for corrosion.

In those times, the problem was compounded by connection practices followed in the field. Business was highly competitive and pipelines were often laid on rumors. This led to laying lines on the ground with the intention of burying them later.

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Since gravity systems were usually laid in creek bottoms and low areas, another problem arose when the oil fields began to make salt water and it was allowed to run down the creek bottoms and low areas. This exposure of the pipeline to a highly corrosive medium has eaten away untold tons of pipeline metal. In some areas, these conditions still exist.

From this early experience in pipeline corrosion, research was started on means to control it. Coating of some type looked like a good solution and much effort has been made through the years to develop better and more economical coatings. This has also led to development of better application methods and improved cathodic-protection facilities.

Case history. Two parallel lines of standard-weight bare pipe were laid from the vicinity of Shreveport to Homer, La. in 1920. There are 30.5 miles of this loop line still in service.

There have been 109 corrosion leaks in this section. Because of this leak experience, cathodic protection was applied in 1956. Since then there have been only four leaks. These occurred very soon after protection was applied.

The corrosion-leak cost, the cathodic-protection cost, and the estimated cost of reconditioning this section are shown graphically in Fig. 1.

These cost figures do not include any amount for the metal loss sustained by the bare pipe during the years it was not protected. No attempt was made to calculate or estimate this figure because of the complexity involved and the probable worth of such an estimate.

Average loss. Consideration of this point did lead to the investigation of average metal loss on buried bare pipe without cathodic protection. It can vary greatly depending on soil conditions.

This is what happened to a bare line in Central Louisiana, just southwest of Alexandria. It was laid in 1950. It consisted of 8-in., 0.322-in.-wall, lapweld, second-hand pipe. Some 14.75 miles were laid bare and 2.1 miles had a cold-applied coating. There was no cathodic protection.

This line was taken up in May 1960 for reconditioning. The coated section showed no appreciable corrosion except in a few local areas. The pipe did show an average wall loss of about 25 miles. This loss evidently occurred before 1950. Since the entire line was reclaimed from the same area, it was assumed that all the pipe was minus about 8% of its original thickness when it was reused in 1950.

Deep pits found. The bare section was uniformly corroded about 35 to 40 mils. This is about a 4% increase during the 10 years it was in service. However, there were numerous areas with 100-mil-plus pits. Because of this, about 3.4 miles were considered unfit for further pipeline use. In addition to the metal loss there were 11 leaks, 2 in 1956, 3 in 1958 and 6 in 1959.

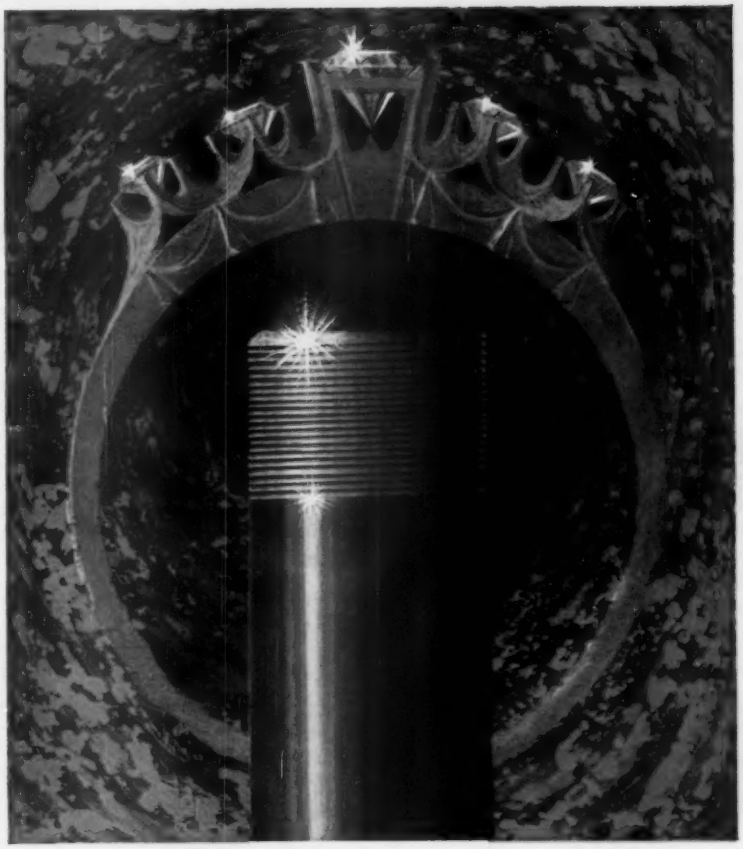
Cost of this corrosion on a per mile-of-pipe basis for the 10-year period is shown in Fig. 2. The extended curve shows the expected corrosion rate as the length of service increases. The estimated cost of cathodic protection is also shown. It compares the payout of protection over letting the pipe corrode.

Corrosion-control costs have been developed from average costs experienced on Interstate's pipelines that have been cathodically protected. Because of the advent of deep ground beds, these costs are shown in four categories. Bare pipe with conventional and deep ground beds and coated pipe with conventional and deep ground beds.

Comparative costs. The cost of installing cathodic protection and the annual operating cost per mile of 12-in. bare line with conventional and with deep ground beds are shown in Fig. 3. These data are representative of lines laid in high-resistance soil of around 100,000 ohm-cm.

Since the factors that aggravate corrosion in pipelines are known, steps should be taken to eliminate as many as feasible. New construction certainly should be so designed to allow for simple inexpensive cathodic protection. Basically, this means that lines should be coated and buried wherever possible.

Deep ground beds. Economics in rectifier-ground-bed facilities should be examined closely on each instal-



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lation. Generally, deep ground beds are most economical in initial installation and operating cost. In areas of high-resistance surface soils, particularly the deep ground bed, can eliminate much expense in surveys locating conventional ground beds. There is also more flexibility in being able to select sites where electric power is readily available. The deep ground bed can be installed within the existing right-of-way if additional right-of-way is hard to get.

The conventional ground bed is equal to or slightly lower in installation cost than the deep ground bed where uniform, low-resistance soil is encountered. This is particularly true where only small current requirements are needed to provide cathodic protection.

Secondary factors. There is no need for extra wall thickness in the pipe to allow for corrosion if cathodic protection is properly designed and operated. Minimum wall thicknesses that meet the working pressure on the line can be used. Considerable savings thus can be realized in pipeline construction.

The approximate total construction and cumulative cathodic-protection cost of 1 mile of 12-in. coated standard-weight pipe; bare standard-weight pipe, and coated thin-wall pipe are shown in Fig. 4. The cathodic-protection figures are based on those presented earlier.

Economics of cathodic protection may seem to be nebulous and hard to sell to management at times. However, a realistic look at the cost of corrosion on bare pipelines, as shown in Fig. 2, can clearly show the payout of cathodic protection. There is no question that cathodic protection is indispensable with coated lines. The lower current requirements of the coated lines allow for smaller installation cost and lower operating cost, as shown by Fig. 3. The greatest over-all economy can be realized by applying a good coating to thin-wall pipe, when practical, and cathodically protecting the system by using a deep ground-bed facility.

Acknowledgment

The author acknowledges the assistance given by Paul Miller, Wilson L. Pevy, and Eugene M. Chambers in compiling data for this paper.

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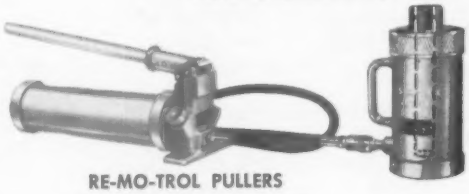

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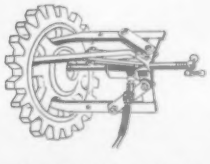

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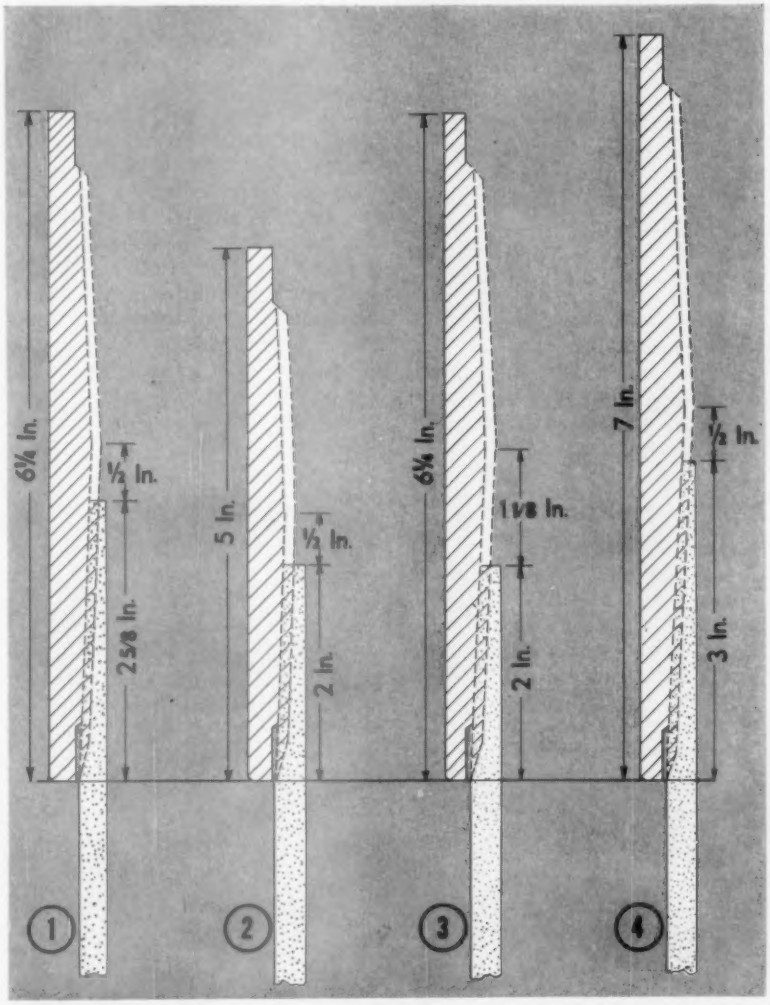
What new standards for 4½-in. API casing mean to users

Safer, faster, and cheaper casing jobs should result. User can run mixed strings without excessive use of crossover joints.

BY JOHN A. CASNER
Supervisor of Tubular Field Engineers,
Youngstown Sheet & Tube Co.,
Youngstown, Ohio

THE API pipe-standardization committee has set up new standards for 4½-in. oil-well casing. Result will be to increase the length of the 4½-in. 8-round short thread length and to add a new wall thickness intermediate between 4½-in.-o.d. 9.50-lb. and 4½-in.-o.d. 11.60-lb. casing.

If the user is aware of the exact nature of the changes being made, he will be able to run mixed strings of 4½-in.-o.d. casing without using an excess number of crossover joints. And he will be warned against those cases where crossover joints may now be required. Thus he can expect a safer, faster, and cheaper casing job.



NEW DIMENSIONS for casing and couplings, as outlined in the new specifications. Figs. 1-4.

Today's pipe. The present API Standard 5A for casing, tubing, and drill pipe includes three weights and wall thicknesses of 4½-in.-o.d. casing:

1. The 9.50-lb. per ft. pipe with 0.205-in. wall thickness.
2. The 11.60-lb. per ft. pipe with 0.224-in. walls.
3. The 13.50-lb. pipe per ft. with 0.250-in. walls.

The 9.50 and 11.60-lb casing is currently equipped with threads of 2-in. length and couplings 5 in. long. These are described as the API short thread and coupling. The 11.60 and 13.50-lb. casing is available with a 3-in. thread length and a coupling 7 in. long, this is the API long thread and coupling.

The new standards were made to improve the leak resistance and joint strength of the 4½-in.-o.d. 8-round short casing thread. Also, it was intended to provide a casing with a wall thickness greater than 0.205-in. to resist damage, etc., without raising the cost to that of the 11.60-lb. pipe.

The new standards will become effective sometime early this year with publication of a new edition of API standard 5A.

The API Pipe Standardization Committee proposed making two changes as follows:

1. Adopting an additional wall thickness for 4½-in. casing of

TABLE 1

Nominal weight	Wall thickness	API short thread and coupling				API long thread and coupling	
		Present		Proposed			
		Thread length	Coupling length	Thread length	Coupling length	Thread length	Coupling length
Lb./ft.		Inches					
9.50	0.205	2	5	2	6¼	..	..
10.50	0.224	..	..	2⅝	6¼	..	..
11.60	0.250	2	5	2⅝	6¼	3	7
13.50	0.290	..	..	..	..	3	7

0.224-in. wall thickness. The pipe would be classified as 10.50 lb. (see Table 1).

2. Revising the API short thread and coupling to increase thread length from 2 in. to 2⅝ in. and the coupling length from 5 in. to 6¼ in. (Except the 9.50-lb. which would continue to use a pipe-thread length of 2 in. The full thread length of 2⅝ in. cannot be put on the thin-wall 9.50-lb. because the thread taper with this length of thread would reduce the wall thickness at the pipe end to a degree which would make damage very easy.)

The future. Figs. 1 through 4 show what these changes will mean to users in the field. As already noted the 9.50 and 11.60-lb. casing is equipped with a thread with a length of 2 in. and a coupling with a length of 5 in. (see Fig. 2). In the new standard the API short thread and coupling will be applied to the 9.50-lb. casing with a thread length of 2 in. and with a coupling length of 6¼ in. (see Fig. 3).

The 10.50 and 11.60-lb. casing will be equipped with threads with a length of 2⅝ in. and a coupling with a length of 6¼ in. (see Fig. 1). No change will be made in the API long thread on 11.60 and 13.50-lb. casing (see Fig. 4).

In the past, the threads and couplings illustrated in Figs. 1 and 4 were in use. In the future, the threads illustrated in Figs. 1, 3, and 4 will be in use. In the interim period, during the changeover, the threads and couplings illustrated in Figs. 1, 2, 3, and 4 will all be in widespread use. In a casing string which combines several types of pipe it may be necessary to use crossover joints so that the various types of ends can be coupled.

What it means. The pitch diameter at the gage point is the same on all of these four threads and couplings. Therefore, the following is obvious: **Any of these threads can be screwed into any coupling whose length is equal to or greater than the coupling length intended for that thread.**

Result of using a coupling longer than necessary is a greater distance between the ends of the pipe and the center of the coupling. This does not interfere with the use or performance of the joint.

On the other hand, it is obvious that you cannot screw a thread into a shorter coupling than required for the thread length. The pipe end may go past the coupling center and interfere with the pipe end which has been screwed into the other end of the coupling.

Three good rules. Thus, in running a mixed string:

1. The present 2-in. short thread and the proposed 2⅝-in. short thread can be screwed into the 7-in. long coupling.

2. The present 2-in. short thread can be screwed into the proposed 6¼-in. short coupling.

3. The 9.50-lb. casing equipped with the new 6¼-in. short coupling can be screwed into the 5-in. short coupling (the 9.50-lb. casing will always be equipped with a 2-in. short thread).

When the casing design permits, the string should be run in such an order as to take advantage of the above rules. Doing so will eliminate the necessity of having special crossover joints made.

If a string is to consist of 11.60-lb. casing, some of which is equipped with the present API 2-in. short thread and some of which is equipped with the proposed API 2⅝-in. short thread, the proposed or new casing should be run on bottom with the present 2-in. short-thread casing on top. The present 2-in. short thread, according to our rules, would screw into the new proposed 6¼-in. coupling which is longer than required. Therefore a crossover joint would be eliminated.

By the same token, care must be taken to see that the new proposed 2⅝-in. short thread on 10.50 or 11.60-lb. casing is not run on top of the present 2-in. short thread on either 9.50 or 11.60-lb. casing equipped with the 5-in. short coupling, since a crossover joint would be required in such a case. The same care must be taken not to run the API long thread on top of any short thread without providing a crossover joint.

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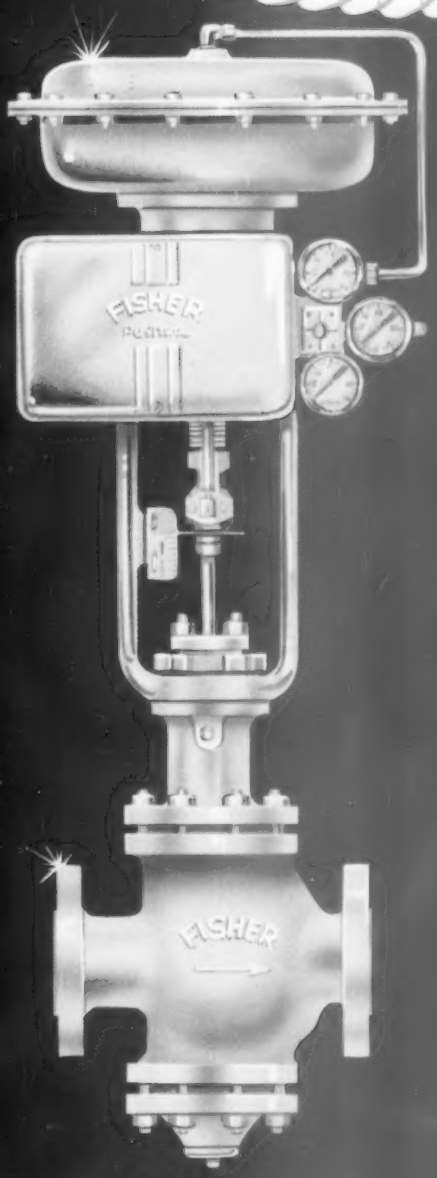

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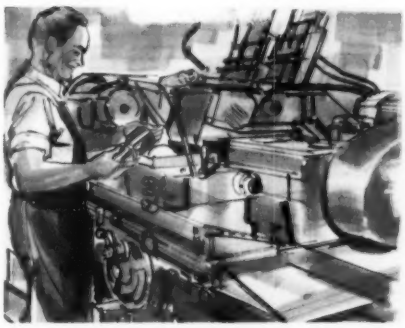

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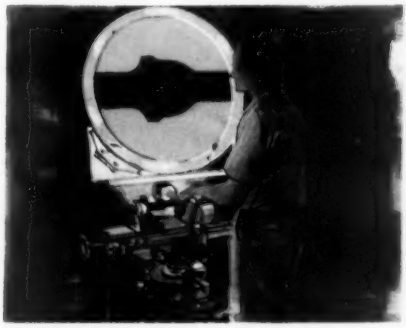

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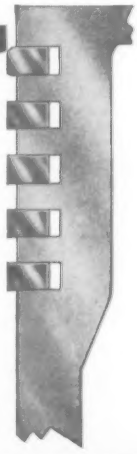

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RECESSED MOUNTING FOR WIRE REEL is shown in this view of left side of specially designed corrosion repair truck.

Truck tailored for corrosion repair

CORROSION repairmen on the Colorado Interstate Gas Co. system should function more efficiently and more easily in the future. Two of them have developed a truck just to facilitate corrosion repairs. It looked so good on its initial test that four more will probably be put into service.

Unusual features of the vehicle include readily accessible compartments for tools and equipment and special mountings for such devices as a wire reel, crane, and pipe-clamp vise. Electrical instruments are carried in compartments lined with foam rubber for added protection. In others, straps are provided for lashing small tools and equipment in place.

The wire reel is mounted in a separate compartment at the left rear of the truck. The pipe clamp vise is carried in a similar compartment at the right rear. A special crane can be operated from the rear. Large tools and equipment are carried in the bed of the truck along with spare tires. This section is covered with a telescoping roof.

The company has been using station wagons to haul personnel, tools, and equipment. While they did the job, they lacked the convenience and organization that characterize the new truck. It is a half-ton chassis on a long wheel base. The long wheel base was chosen for improved riding quality.

The truck is the brain child of Mel Sinton and P. W. Harrison. W. I. Blount, superintendent of dispatching and maintenance, has indicated that additional trucks, with further modification, will be added in the future.

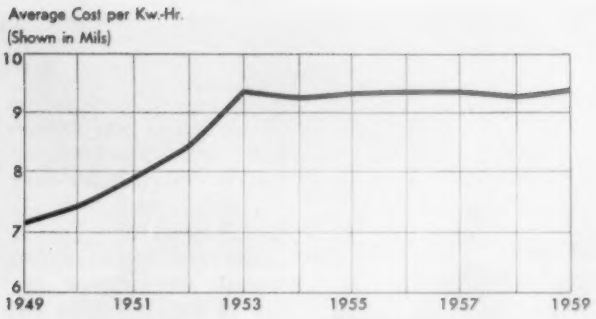
Hinged boards cut gasket storage space

SPARE GASKETS are stored conveniently and orderly in Northern Natural Gas Co.'s compressor station at Hugoton, Kans.

The gaskets are mounted on hinged plywood boards which can be swung back to the wall. This makes it possible to store a large number of gaskets in relatively little space.

The gaskets are grouped on the boards according to the engines for which they are intended. The engine number appears on the top of each board. There are several makes and models of engines in the station and each has its own separate gasket board.

The idea of placing gaskets on boards in this manner originated with Millard A. Williams, warehouseman at Hugoton. Dale G. Kullbom, compressor-plant superintendent, examines one of the boards.



ELECTRIC POWER USE quadruples in decade, Fig. 1.

Oil men using more electricity

OIL is becoming an increasingly large consumer of electric power. The growth has been so great that electric energy is now one of the industry's major operating costs, and indications are that the industry's bill for electric power will be still larger in the future.

According to C. F. Leslie, Phillips Petroleum Co., Bartlesville, Okla., his company's purchases of electric power have almost quadrupled in the decade from 1949 to 1959. They were about 320 million kw.-hr. in 1949 and more than 1,200 million kw.-hr. in 1959 (Fig. 1).

Leslie credits the utilities with holding the line on costs in recent years. The company's costs per kw.-hr. have been almost unchanged since 1953 (Fig. 2). However, he adds, "recently negotiated contracts will, no doubt, result in an upward trend of this curve."

Ways to help. Leslie believes there is a variety of ways the utilities can and should ease the load on the oil companies, citing pipeline operations in particular. These are some of the points he makes:

1. A spot check of pipeline stations shows that their electric-power costs are higher than the company average despite a generally good load factor. It showed that the station with the highest demand and load factor paid the highest rate, 1.39 cents per kw-hr., while another station with a much smaller demand and far lower load factor paid 0.775 cents per kw.-hr.

2. Certain aspects of agreements should be bilateral, such as a force majeure clause which now protects only the supplier but which should also protect the customer.

3. Minimums should be negotiated so as to provide relief for the pipeline operator if some unforeseen difficulty forces him to curtail operations in a year in which his total payments more than compensate the supplier for his services.

Overcompensation. 4. Double demand charges and "overcompensating" fuel clauses are hard to understand. The need for a fuel clause in a fixed-rate contract is understandable but the formula on which it is based is overcompensated.

5. Across-the-line starting is a recognized problem. It is felt that the supplier should institute a request for reduced voltage starting only after a thorough study is made of the transmission system.

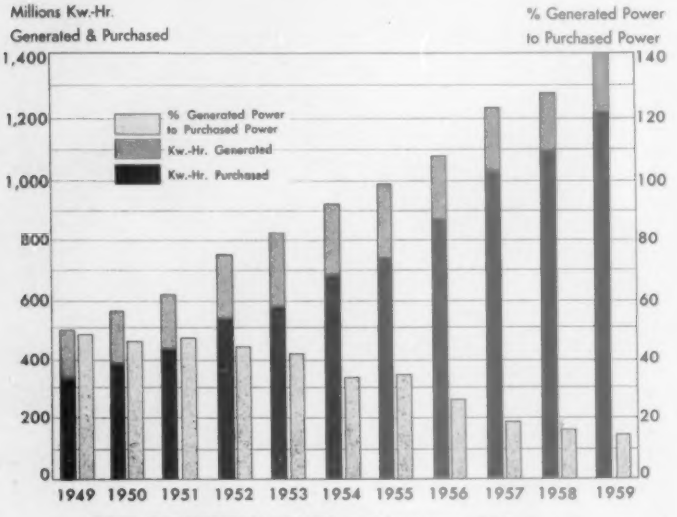
6. The trend toward a complete service by the utility whereby service is furnished directly to the customer at utilization voltage should be encouraged. Any method that allows the customer's cost to be charged off as an operating expense has important economic advantages.

7. More informative billing would be helpful. It would show, particularly for a pumping station, kilowatt hours, kilowatt demand, and any special charges for fuel costs, transformer rentals, and power-factor adjustments.

Outages costly. Outages, Leslie said, have resulted in "losses totaling well over $100,000 in one plant." They are particularly acute in processing plants and pipe lines because they result in losses "not only in down time, but also in lost product, difficulty in establishing normal operations, damage to equipment, and often danger to life and property."

Much has been done, he admitted, but the problem is still very real and much remains to be done by the utilities. "We look forward to the day," he said, "in which economical purchased power will be free of interruptions of any kind—even momentary voltage dips which often allow electric motors to drop off line."

Phillips has a program of keeping records of each outage so that particular trouble spots can be located and corrected. The utilities, Leslie said, should also have competent engineers make a complete investigation of each outage and report to the customers on the contributing factors and what corrective action is proposed to prevent recurrences.



COST OF ELECTRIC POWER stable since 1953, Fig. 2.

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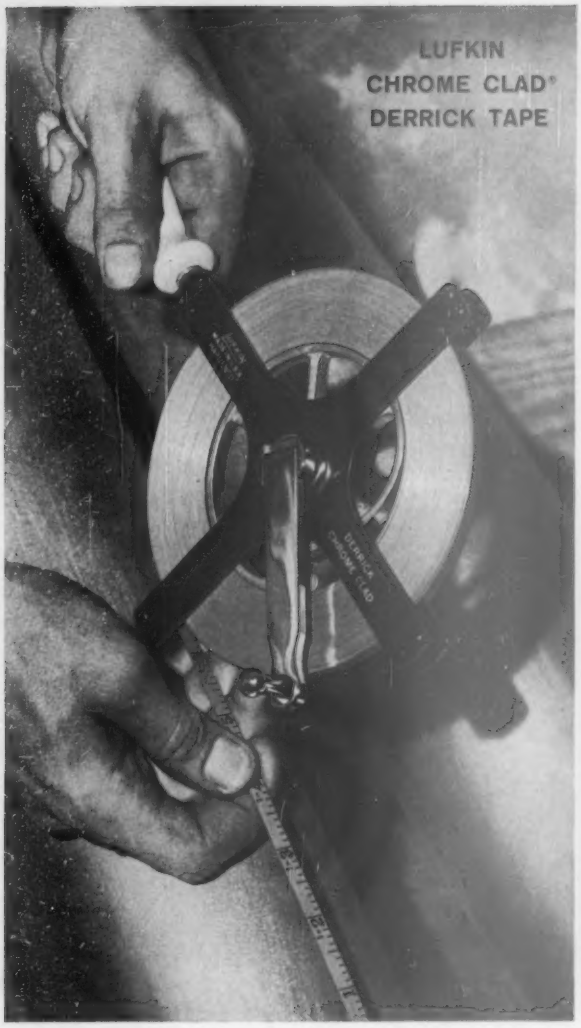
MANUFACTURERS OF PACKAGED COMPRESSOR PLANTS FOR GAS GATHERING, GAS LIFT, GAS INJECTION APPLICATIONS



Exclusive LUFKIN Chrome Clad® lines defy grit, grease, gravel—and rugged use!

Here are "he-man tapes" that work like troopers when the job's toughest!

Easy-to-read markings will *stay* easy to read, because they're bonded to steel, electroplated and chrome coated. Lines won't kink or break. Sturdy metal construction (except for carrying handle). It all adds up to two-fisted quality that *lasts!*

Exclusive quality features are yours in *all* Lufkin tapes. For example:

Lufkin Chrome Clad® DERRICK Tape (above, left) gives you instant readings on a line that won't rust, chip or peel. An extra-sturdy line, ¼" wide, with hook and ring. Lock-handle frame. Turn handle over, lock line at any point. Available in 100-200′ lengths.

Lufkin "ATLAS" Gaging Tape (above, right) gives you easier reading, too, with durable, jet-black markings on glare-free line. Line is 50% heavier than standard. Has 20-ounce plumb bob, and sturdy lock-handle frame.

See your Oil Supply House.

Measure for measure, the finest made...

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SAGINAW, MICHIGAN

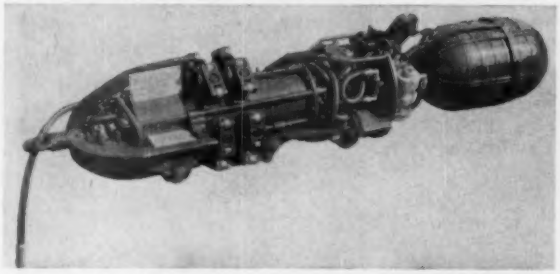
▶▶▶ New Equipment Section

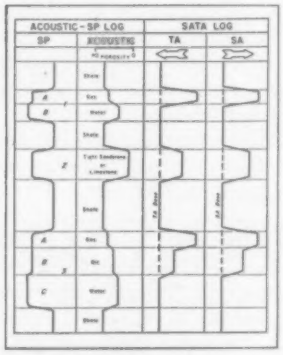
This week's SHOWCASE features . . .

Accurate lineup for 12-in. pipe and larger

. . . is offered by a new pneumatic pipe lineup clamp. According to the maker, the C-R-C air clamp permits 12 and 14-in.-diameter pipe to be lined up as accurately as larger pipe. It thus offers a way to reduce pipe-laying time for smaller pipe.

Measuring 58 in. long and weighing 215 lb., the clamp features pneumatically controlled heads that operate independently. These are claimed to give fast and positive lineup of two joints of different thicknesses. All working parts are enclosed. A 1,200-cu.-in. air-reserve tank permits several lineups without repressuring. Source: **Crutcher-Rolfs-Cummings, Inc., 7825 Katy Road, Houston, Tex., U.S.A.**



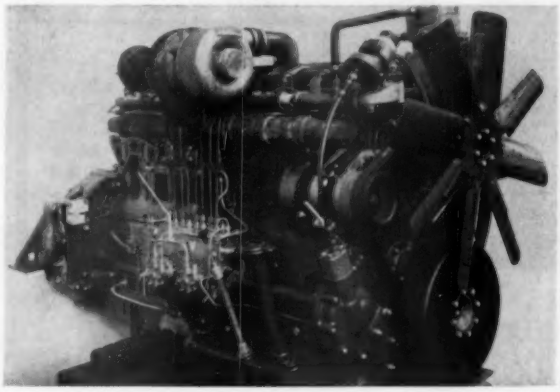


Newest type of well log

. . . the Sata log, uses an unusual application of acoustic logging. The log exhibits two curves. One is the attenuation of the acoustic signal (SA) between two receivers. The other is the transmission amplitude (TA) of the acoustic energy at the first receiver.

Distinct acoustic properties of hydrocarbons are said to enable this log to distinguish between gas, oil, and water on a qualitative basis in both high and low-porosity media. The maker makes no quantitative claims at present for the Sata log technique.

Applications for the Sata log are said to be especially good in fresh-water sands and in reservoirs which contain enough shale and salt water to cause low-resistivity readings on electrical logs. Source: **Pan Geo Atlas Corp., Box 14524, Houston 21, Tex., U.S.A.**



New line of diesels

. . . made in England, comes in three models: four, six, and eight cylinders. They have individual four-valve cylinder heads. The individual cylinder heads are said to eliminate the need for hoisting equipment during field servicing. Also, a tight seal can be obtained between the cylinder heads and their liners.

Other features of the Mark IV engines include a new type of piston. These are fitted to increase engine reliability and to reduce the

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Product name, Model no., literature title or number: .....

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Described in OIL AND GAS JOURNAL - Issue of **January 16, 1961**

NAME..... TITLE.....

COMPANY.....

ADDRESS.....

CITY..... STATE.....

Hartzell Glass Plastic blades are being used in this forced draft heat exchanger operation at El Paso Natural Gas Company's Jal, New Mexico Plant #4. They are 10 feet in diameter and were installed December 22, 1958.

Provides More Efficient, Less Costly Installation, Cooling, Maintenance

• Lightweight (¼ that of standard plastic blade) yet unusually strong. This saves wear and maintenance on bearings, gears, shafts, support members . . . power consumption because it takes less horsepower to move large volumes of air. • Superior resistance to acids, corrosive material, abrasive and impingement effects. • Economical in forced and induced draft, wet and dry applications . . . cooling towers and heat exchangers. • Blades dynamically balanced to hub for quick easy installation and replacement in any Hartzell steel hub. • Design puts fan noise at a minimum. • No painting or finishing—color is in raw material. • Four and six blade assemblies.

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PROPELLER FAN CO.
Div. of Castle Hills Corp.
Piqua, Ohio

Engineering Offices in Principal Cities

tendency toward crankcase and cylinder liner erosion, the maker says. Source: **Oil Engine Div., Rolls-Royce, Sentinel Works, Shrewsbury, England.**

•

Valve with

. . . nylon-tipped stem is designed to permit fingertip closing and to seal without grooving at pressures up to 1,000 psi. The brass needle valve offers a way to control the flow of air, water, oil, or other fluids not injurious to brass.

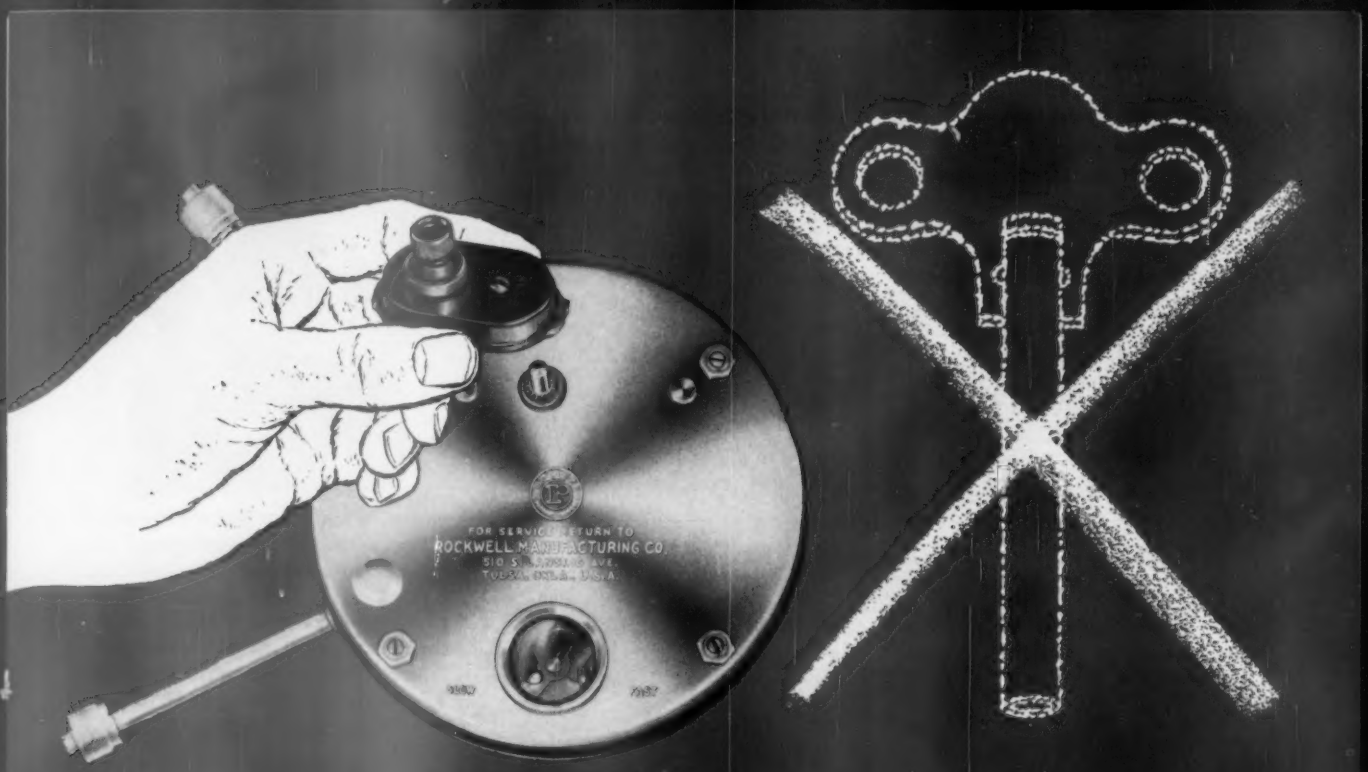
The valve serves either for shut-off or throttling. All parts are machined from brass bar stock. A taper metal-to-metal seal prevents leaks between the body and bonnet. No gaskets or joint compound is needed, the maker says. If needed, the valve-stem packing is easy to replace. Source: **Chandler Engineering Co., 320 S. Kenosha, Tulsa, Okla., U.S.A.**

•

Ready-mixed epoxy enamel

. . . is being marketed for use as a maintenance coating on surfaces and equipment exposed to alkali and acid fumes. Tradenamed Corlar, the product is said to offer an order of chemical resistance between the catalyzed epoxies and alkyds.

The product is a single-package ready-mixed epoxy enamel that is said to eliminate mixing in the field as well as the problem of the limited pot life of catalyzed epoxy formulations. Available in white and nine colors, the coating goes on easily by brush, roller, or spray and is said to dry tack-free in 6 hours. Source: **E. I. du Pont de Nemours & Co., Wilmington 98, Del., U.S.A.**



Illustrating how speed changing turrets are applied to the chart arbor

You never need to wind the Rockwell Gas Drive

GAS (OR AIR) POWERS THIS NEW CHART TIMING DRIVE. With it you can forget the costly chore of periodic winding. It's completely self-starting, self-contained. You can use the Rockwell Gas Drive with profit and gain accurate, automatic operation of recording charts on practically any make orifice meter, gas lift intermitter, pressure recorder or temperature gauge. It is particularly applicable for remotely located instruments.

Since the Rockwell Gas Drive consumes only 6 cubic feet of gas in 24 hours it is economical to use—safe, too, for there is no exhaust problem.

The Gas Drive operates on a pressure range of 15-25 psi and delivers 15 in. lbs. of torque to the main arbor which rotates once every 24 hours. Geared turrets which snap onto this arbor provide optional speeds of 2, 3, 4, 6, 12, 48 or 72 hour, 7 or 8 day rotation. So with a stock of Rockwell Gas Drives, plus a selection of economical turrets, you can serve all your instrument needs. Get facts now. Write Rockwell Manufacturing Company, Pittsburgh 8, Pa. In Canada: Rockwell Manufacturing Company of Canada, Ltd., Guelph, Ontario.

◀ Rockwell Gas Drive powers this typical intermitter

GAS DRIVES, CHART DRIVES

another fine product by

ROCKWELL

Air-conditioned protective suit

. . . has been developed for workers who must be exposed to toxic fumes, fire fighting, and rescue work. The control system in the suit consists of a cylindrical cryogenic air-storage vessel that supplies breathing air, a quantity gage, ejector for circulating air, heat exchanger for cooling recirculated air, and a trap for collecting solids and entrained water.

Enough liquid air is provided to support one man for 2 hours before recharging is needed. The environmental system may be worn inside the suit. Or it can be mounted externally.

When the suit is in use, warm air returning from the suit passes through a finned-tube heat exchanger. Heat from the warm air vaporizes and warms the liquid air fed into the system as makeup from the storage vessel. The cold makeup air (at −180° F. and 15 psig.) then passes through an ejector. The ejector furnishes the pressure needed to maintain flow through the suit, heat exchanger, water trap, valves, and lines. Ejector makeup air mixes with the circulating return air in a mixing zone and then returns to the ventilation distributor of the suit after it passes through the heat exchanger and water separator. Source: **Garrett Corp., AiResearch Mfg. Div., 9851 Sepulveda Blvd., Los Angeles 45, Calif., U.S.A.**

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TYPE 30 — Carbon-Manganese fully normalized. For heavy duty where corrosion is not a major problem.

TYPE 75 — Nickel-Chromium-Molybdenum Steel, normalized and tempered. For extremely heavy duty in medium corrosive fluids.

TYPE 40 — Nickel-Molybdenum Alloy. Normalized and tempered. For heavy duty pumping in medium corrosive conditions.

TYPE 78 — Carbon-Chromium-Molybdenum Boron Alloy, normalized and tempered. For heavy duty pumping in non-corrosive or inhibited fluids.

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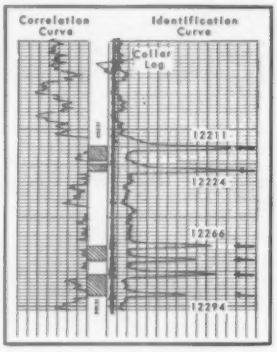

Newest perforations log

. . . confirms the placement of shaped-charge perforations with respect to the productive zone. The PIP (precision identified perforations) log method uses specially shaped charges fired at top and bottom of the perforated interval. These charges leave traces of radioactive material within the perforations which are indicated by sharp peaks on the gamma-ray recording run after perforating.

This logging service is offered as a supplement to the perforating depth-control log. It is presently being made available on perforations performed with retrievable shaped-charge perforators. Source: **Schlumberger Well Surveying Corp., P. O. Box 2175; Houston, Tex., U.S.A.**

SHOWCASE . . .

New Literature

How Good is a Sound Barrier?

. . . is the title of a 12-page engineering report just published, explaining in detail how to calculate the effectiveness of a partition or sound barrier. In addition to showing the sound-transmission characteristics of a number of conventional wall constructions, the report includes calculation methods applicable to most simple partitions. "Noise-criterion" charts are included so that reasonable sound-level targets can be set. Source: **Lead Industries Assn., 292 Madison Ave., New York 17, N. Y., U.S.A.**

Oil-field-motor bulletin

. . . on polyphase squirrel-cage induction motors, from 1 to 150 hp., discusses the Types SC, SCH, SCS, and SCT motors. The bulletin gives typical performance curves, application data, ratings, and dimensions. Source: **Century Electric Co., 18th and Pine Sts., St. Louis 3, Mo., U.S.A.**

Split-case centrifugal pumps

. . . of the vertical, two-stage variety, are illustrated and described in a new two-page literature sheet. The Type AJV pump comes complete with capacities to 1,400 g.p.m. and heads to 425 ft. The bulletin gives specifications, applications, a parts list, and dimensional drawings. Source: **Aurora Pump Div., New York Air Brake Co., Aurora, Ill., U.S.A.**

Air-powered boring unit

. . . is outlined in a new bulletin which illustrates and describes the A295 unit. Presented are a capacity chart, pictures of field applications, and a discussion of various types of cutting heads. Source: **Kwik - Mix Co., 235 W. Grand Ave., Port Washington, Wis., U.S.A.**

Sheet-metal publication

. . . entitled "The Modern Method of Using 'Pre Tensed' Sheet Metal," contains technical data and descriptive test to explain the strength and rigidity inherent in the assembled structure components. The bulletin deals with physical details of structural components, construction suggestions for typical installations, assembly and layout plans to fit a variety of applications, and a simple guide to the materials needed for specific structures. Applications include: processing towers, housings to protect instruments and equipment from temperature variations, pumping stations and other pipeline installations, special and all-purpose buildings, truck and trailer bodies, enclosures, and other installations. Source: **Lindsay Div., International Steel Co., Evansville 7, Ind., U.S.A.**

Regulators and valves

. . . are covered in a trio of specifications sheets which give features and specifications on six products. Bulletin 136 covers Reliance Type P pressure regulators; Bulletin 151 describes Reliance Series RV200 and 201 and DV200 and 201 valves; and Bulletin 152 details the Reliance Type PLV pressure-limiting valve. Source: **American Meter Co., 920 Payne Ave., Erie 6, Pa., U.S.A.**

RUGGED

GORMAN-RUPP 6-INCH

rugged is the word for this new 90-M!

Put this new "80" Series pump on the job anywhere . . . this is what you've got! *Amazing performance*, proved time after time. *Higher suction lifts*, and *peak efficiency*, resulting from Gorman-Rupp's patented design. *Fast starts, surer starts* —with high speed repriming. *Dependability*, backed by Gorman-Rupp. Isn't it time you tried one of the new "80" Series Pumps? They're available now.

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Gorman-Rupp of Canada, Ltd., St. Thomas, Ontario

▶ ▶ ▶ Equipment Men Notes

Hughes Tool Co. elects

. . . W. H. Siems to the board of directors, and Raymond M. Holliday to secretary, following the retirement of

W. H. Siems

R. M. Holliday

Chester S. Johnson, vice president, director, and secretary. The announcement comes from M. E. Montrose, senior vice president and general manager.

Siems, as vice president—sales, directs the world-wide sales activities of Hughes and its subsidiaries. He has been with the company 35 years. For 25 years he directed the company's export sales with headquarters in New York. He was transferred to Houston in 1949 to become general sales manager, and was promoted to vice president—sales in October 1959.

Holliday, a director and vice president — finance, also holds directorships and executive positions in other Hughes enterprises. For the past several years, he has been assistant secretary and assistant treasurer. He joined the organization in 1938.

Grove Valve & Regulator makes

. . . two major personnel promotions. Harold Wolpman takes over as senior vice president, in which position he will be in charge of plant engineering, plant structures, and new plant locations. Previously he was vice president—plant engineering for the Oakland-based manufacturer of gate valves and regulators.

Walter L. Connolly has been appointed vice president—manufacturing, and will locate at the company's

Harold Wolpman

W. L. Connolly

Oakland plant. His previous position was director general of Grove France, the firm's Paris subsidiary. Connolly joined Grove in 1944 as an engineer and was promoted to chief engineer prior to his post with Grove France.

John D. Mitcham is named

. . . plant sales engineer at the Gainesville, Tex. plant of National Supply Co. He will be responsible for sales and service of torque converters manufactured at Gainesville, and hydraulic couplings and other industrial products made at Torrance, Calif. Engineering, sales, and service facilities for torque converters have been consolidated at the Gainesville plant. Mitcham started with National Supply in 1935 and served in sales and engineering capacities at Houston, Beaumont, and Wichita Falls, Tex., and Toledo, Ohio. He has been closely associated with the torque-converter program since 1956.

Kenneth S. Bayless is elected

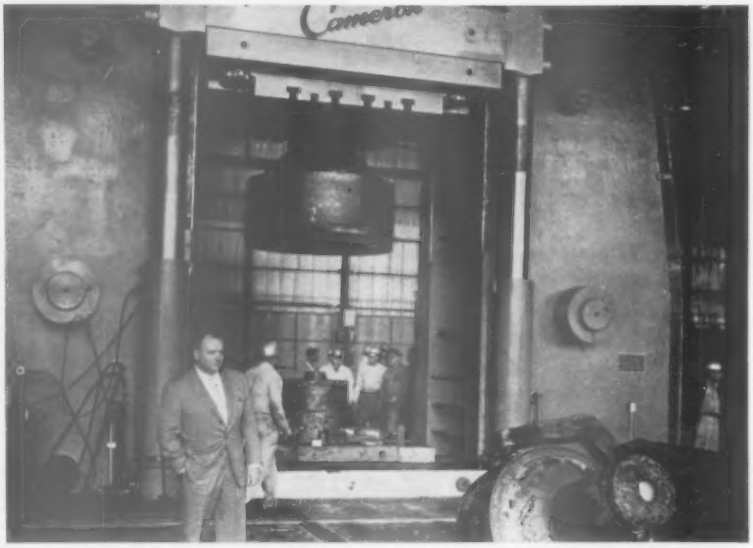
. . . executive vice president of Cal-Metal Pipe Corp. of Louisiana, succeeding R. C. Stewart. The electee was formerly vice president in charge of sales. Bayless has served in both managerial and sales capacities. At one time he was in charge of financial forecasting for Kaiser Aluminum & Chemical Corp. in California.

20,000-ton forging press designed by Cameron Iron Works

. . . and built at the Cameron plant just west of Houston. Supporting this massive piece of equipment are two other major presses. Preliminary blocking and forming is performed on a 4,000-ton press, and final shaping and piercing on a 6,000-ton press.

The frame is 50 ft. from top to bottom; it's 31 ft. across the bottom. When desired, the operator can drop the main piercing ram assembly out of the press, which leaves a 56-in. hole in the main bolsters and in the moving platen and the top platen. Thus Cameron can produce an extrusion up to 30 ft. long and to 56 in. in diameter, limited to 30,000 lb.

Complete with its foundation the press weighs more than 4,000,000 lb. The press itself weighs a little over 3,000,000 lb. Huge, intricate shapes and sizes can be forged by using split die techniques. The throttling control, or flow control, is so worked out that the press can be operated anywhere within a range of 0 to 400 f.p.m.



Herbert Allen, vice president and general manager of Cameron Iron Works, Inc., inspects one of the first forgings made on his company's new 20,000-ton forging press in Houston.

Aside from ferrous metals the press can handle molybdenum, tungsten, tantalum, moly tungsten, tantalum tungsten, columbium, and other alloys.

We Make Them All

Bethlehem makes flanged-and-dished heads to meet virtually every requirement: ASME Code, elliptical and standard flanged-and-dished. Also flanged-only, dished-only, shallow-dished, double-dished, and heads for special requirements.

Bethlehem heads are available in diameters up to 165-in.—and in thicknesses from 14 gage to 3-in. We also produce standard manhole and hand-hole saddles, covers and fittings, as well as heads with flued openings. A number of sizes of ASME Code flanged-and-dished heads are stocked for prompt delivery.

HOW TO REDUCE COSTS BEFORE YOU ORDER

A number of suggestions that may help you to reduce costs are contained in our folder "Pertinent Facts on Purchasing Flanged and Dished Heads." Factors that govern the price of heads are described, and a list of the required data for orders and inquiries is included. Ordering from our stock sizes at Sparrows Point, Md., may save you time and money; a full list is contained in the folder. A copy is yours for the asking at any Bethlehem sales office, or write to us direct at Bethlehem, Pa.

Steel

For strength
. . . economy
. . . versatility

BETHLEHEM STEEL COMPANY, Bethlehem, Pa.
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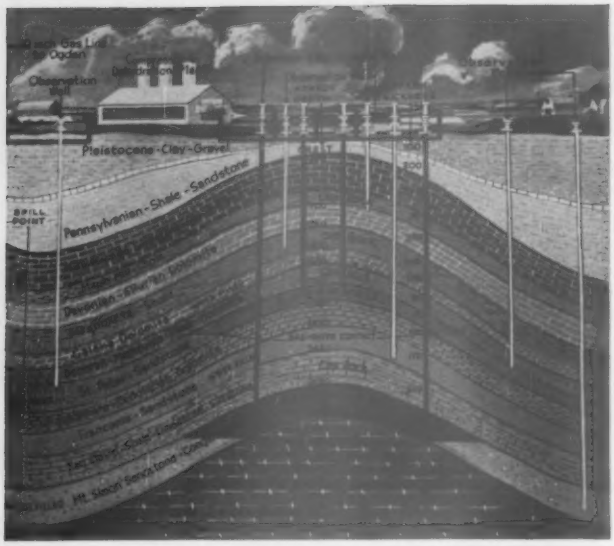
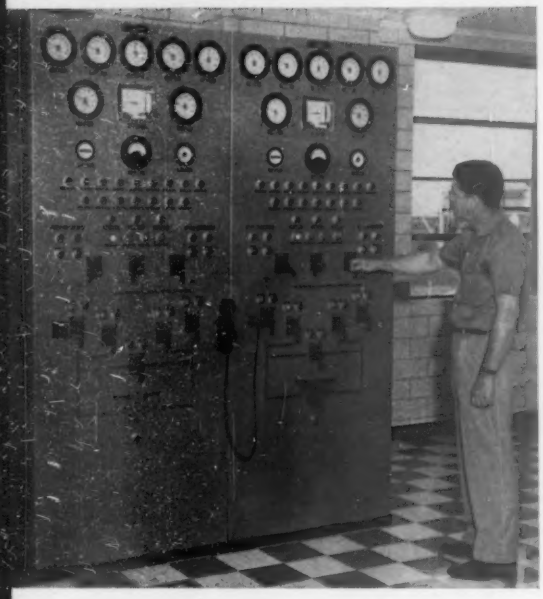
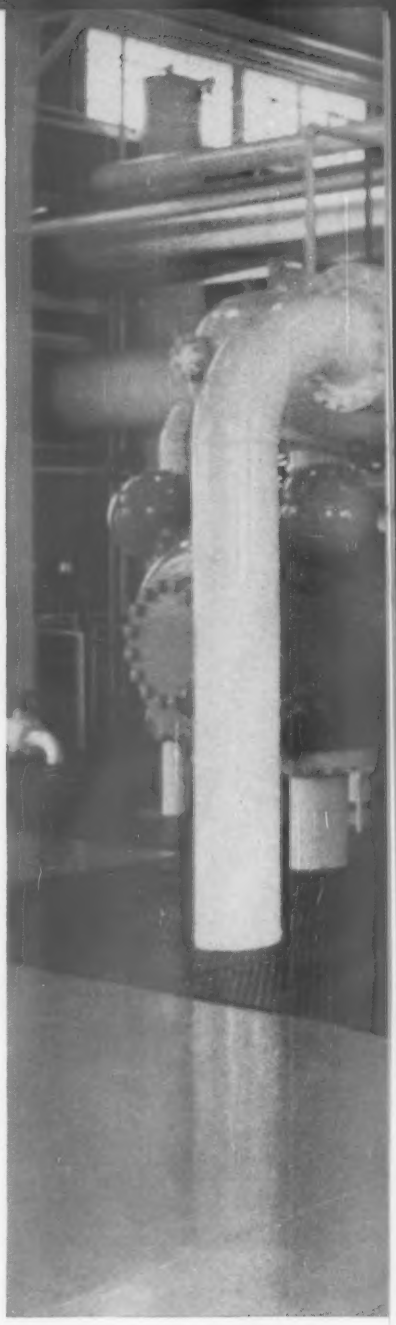


▲ Cutaway drawing of underground storage reservoir at Redfield. This station injects into St. Peter and Mt. Simon sandstone at 59 wells. Ultimate capacity of both strata is about 140 billion cu. ft.



M. H. Raven (right), Superintendent of ▶ Northern Natural Gas Company's underground storage compressor station near Redfield, Iowa, until his recent promotion, discusses the facts with H. E. Hansen, Shift Engineer. Compressor in foreground is GMWA-8, rated 2000 hp. Another similar unit is in the background.

◀ Cooper-Bessemer En-Tronic control provides complete start-stop, loading–unloading automation for the engine driven compressor.



How a rugged <u>two-cycle</u> compressor aids a variable-load gas storage program

During its first year's operation, Redfield Station of Northern Natural Gas Company has been put through a rigorous test. According to M. H. Raven, Superintendent, "Our Cooper-Bessemer GMWA-8 Compressor and En-Tronic Control have responded round-the-clock to this program of normal loading, underloading and overloading with remarkable performance. Despite abnormal loading, oil consumption and water usage have been very low. Inspection and cleaning after 12,000 hours showed all parts in perfect condition. It is a *rugged* machine!"

Call our nearest office for help in applying this kind of dependability and load flexibility to *your* compressor operations.

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REPUBLIC
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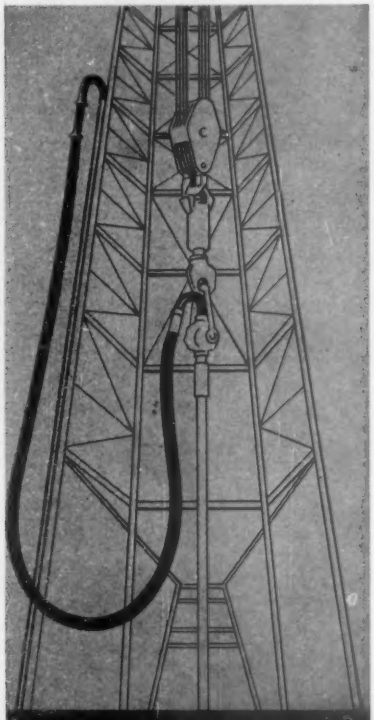
tool pushers agree . . . .

"NO KNOTS IN REPUBLIC HOSE!"

Equal tension on each steel cable prevents knots.



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▶ ▶ ▶ **Among the Drilling Contractors**

How to drill deeper holes cheaper

Here's a synopsis of the latest methods, techniques, and changes to cut drilling costs.

A RECENT REPORT from one of the nation's largest drilling contractors shows what this company has done not only to cut costs but also to drill deeper holes cheaper. With the increased tendency to drill in the 18,000 to 20,000-ft. range, changes were necessary to save money. Today, with 15,000 to 20,000-ft. wells routine, costs have been slashed from 2-3 million dollars down to 1-1¼ million dollars for the deeper wells.

Although the deep boom does not seem to be confined to any particular area or region, it appears to be a popular trend.

Here's what one of the top 10 drilling contractors in the nation—Parker Drilling Co., Tulsa, with 30 rigs—has learned.

These factors relate mostly to drilling procedures and programs in Oklahoma and West Texas, but are also applicable in part to other regions of the country. Giant heavy rigs are not as much in demand as formerly, because no substantial savings were accomplished with extra large equipment, and no material reduction in time was effected. Adaptations of existing rigs for deeper drilling appears more applicable.

An earlier trend is noted toward extreme hydraulic programs. But excessive drilling pressures of 3,000 lb. and greater in normal-sized holes did not increase penetration rates but ran up operating costs.

Casing programs are scrutinized carefully for improvement.

Another trend noted is for better mud programs and simplified supervision of operations.

Slim-hole drilling (6¼-in. and less) has proved practical in deeper wells, because of better diamond bits and efficient hydraulic systems.

In the report a trend is noted toward more deep wells using smaller casing strings. Slim-hole techniques have been generally successful. Exceptions are unexpected lost circulation, high-pressure zones, etc., that require unplanned protective strings of casing. On the other hand, slim holes lack the safety factor of having large casing to provide room for additional small strings when necessary to complete the well.

Although pressure and hydraulic programs in big holes have not proved as successful as expected, pressure and hydraulic programs in small holes using oil mud and diamond bits have been successful.

Drillable quality of mud directly determines the extent of pressure hydraulics. An oil content of 10 to 15% in the mud greatly increases the desired effect. A trend toward lighter mud which provides fair samples but reduces drilling time 25% (and costs) is popular. If oil is used in deep-hole mud, drilling cost can be slashed as much as $2 to $3 per foot.

Equipment Changes

Deeper drilling has required these equipment changes:

- Compounds. A switch is apparent toward greater use of electric power, thereby reducing power transmission by chains.
- Drill pipe. Pronounced trend to higher-strength drill pipe is prevalent.
- Drill collars. Few changes except a definite program of periodic inspections has reduced drill-collar fishing jobs as much as 80% during the past 2 years.
- Bits. Better bits have been developed which are available in all sizes and types.
- Pumps. Few changes have occurred so far. A great need exists for high-pressure, short-stroke pumps for continuous duty. Volume is not a major requirement.
- Slips. New-design slips have solved the problem of drill-pipe damage on heavy strings, and have eliminated the need for hazardous double-elevator practices.
- Substructure. Substructures are getting higher and higher, and 25-ft. height is not uncommon today.
- Blowout preventers. A strong trend toward high-pressure equipment is apparent, and it is not un-

MARTIN RUBBER & DUCK RINGS give excellent life in dirty abrasive fluids . . . high or low gravity . . . much or little water . . . shallow or deep wells. They last for years in the easier pumping wells. Replacement rings cost comparatively little.

MARTIN PLUNGER BODIES, precision grooved, drilled and threaded (no underneath fluid passage), usually last for years. Tube or barrel costs are often cut in half.

The replaceable SYNTHETIC RUBBER GUIDES in MARTIN CAGES last longer than any metal, and the cushioning of the ball increases your ball & seat life. Results are often truly amazing. (Patent No. 2,591,174)

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usual to invest $250,000 in a blowout preventer and control system on deep wells.

It is significant that no changes in draw works and engines are required.

A dire need is felt for standardization of equipment requirements by the major companies. Operator requirements vary greatly from company to company.

There is a trend toward mud systems that allow high-pressure gas to come through the mud during drilling. The older procedure of heavy mud holding back high-pressure gas zones greatly hampered rate of penetration.

One problem still present is balancing mud weight to lost-circulation zones. Frequently the weight required to hold these pressures will break down the weaker formations in the well and keep the mud system in constant turmoil.

Gas and air drilling are still a major consideration. The application of these techniques is limited to specific areas where they effect major savings. Savings do occur in very hard drilling formations. A rule-of-thumb might be: The rate of penetration must be increased at least 50% to justify hazards and costs of air-gas drilling over mud systems.

Combination systems, such as aerated mud, soap, and mist drilling, remain to be evaluated.

Cold weather is signal for work

JUST BEHIND the freezing weather are the road crews that have been waiting the wintry blast so that the big rigs can move in and go to work. In the northern areas of western Canada, this is an annual event. The cold-weather season is the time to explore for oil and develop the reserves found last year. In many areas the bulk of the drilling is done during the cold winter and only then across frozen ground can the equipment be moved, usually starting in December.

According to the Canadian Association of Oilwell Drilling Contractors, the last rig-count survey showed 202 active rigs. There were 182 drilling, 15 moved in, and 5 rigging up.

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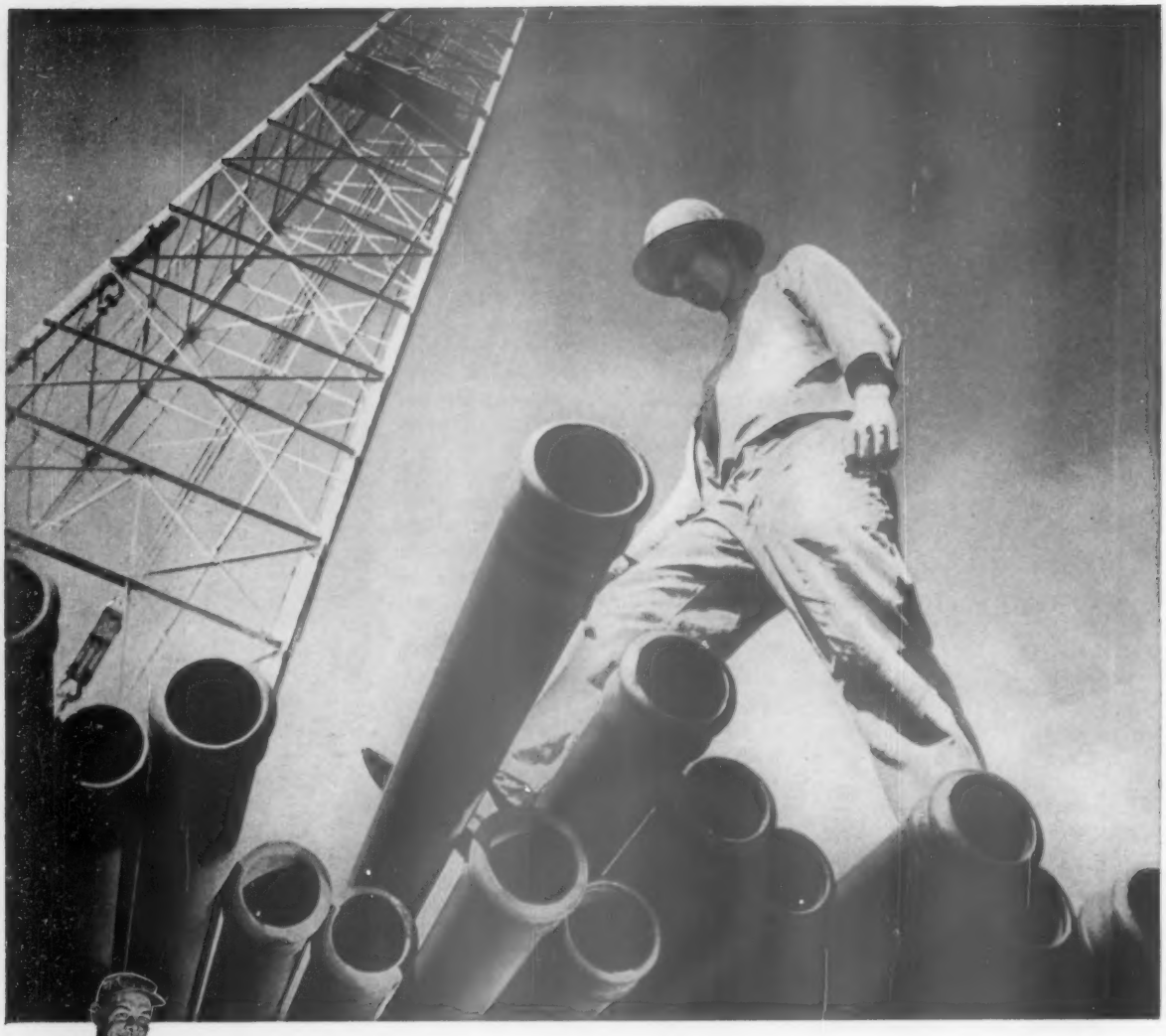

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FIRST HOLES in the Mohole project will be sunk into the ocean floor off Guadalupe Island next March. These experimental drillings will provide the basis for the true Mohole, whose drilling is still several years away.

Oil stands to gain from the Mohole

BY FRANK J. GARDNER

THE ANNOUNCEMENT of contract awards for the first experimental drilling in the Mohole project (OGJ, Jan. 2, 1961, p. 52) was received with mixed reactions by oil hunters. There are those who view the entire undertaking as a waste of time and money, while others (and these are in the majority) see it as one of the most significant scientific experiments of modern times. Viewed from any perspective, however, one thing stands out . . . the oil industry should learn a lot from it.

A four-letter word . . . The ultimate objective, of course, is to drill a hole completely through the crust of the earth in an effort to determine the composition of the crust itself, and of the underlying "mantle" of the earth. The boundary between crust and mantle is known as the Mohorovicic discontinuity; it is named for a Yugoslav seismologist whose studies first pointed to the existence of such a boundary. Its jawbreaker name now has been shortened to "Moho," and the drilling project itself to the "Mohole."

First test drilling will take place in March, east of Guadalupe Island, in the Pacific Ocean west of Mexico. The National Science Foundation has awarded a $735,750 contract to Global Marine Exploration Co. of Los Angeles for the initial venture. The 260-ft. drilling ship, CUSS I, will be used; it will be unmoored in 12,000 ft. of water, and four large outboard motors at its corners will hold the ship in position.

The primary purpose of these first operations is not to drill the Mohole itself, for that's still a long way off, but to confirm engineering principles involved in drilling in waters of such depth. And from this, certainly, oil men stand to learn plenty. Offshore drilling so far has been confined to 400 ft. of water, with some shipside drilling in 1,500-ft. depths. If it should develop that water depth is no deterrent to exploratory drilling, boundless new theaters of operation would lie before oil seekers the world over.

Means a 5-mile hole . . . Selection of the site for the true Mohole lies in the future. But it must be drilled at some point in the ocean, where the earth's crust is thinnest. Underneath the continents, and especially beneath mountainous areas, the crust is much too thick (up to 20 miles). Under the oceans, however, it may be as thin as 15,800 ft., and water depth at the final Mohole site may exceed 18,000 ft.

Besides the drilling know-how to be gained, a great deal of scientific data is expected to pile up on the decks of CUSS I. Ocean sediments are believed to hold many secrets concerning the history of oceans themselves, climatic changes in times long past, and the evolution of life itself. Cores and sediments that are brought up from the ocean floor will be closely studied for clues to a better understanding of these subjects. The rocks that are penetrated will be thoroughly tested for electrical and heat conductivity, seismic velocity, and magnetic and gravitational properties.

In short, for a period of about a month, beginning in March, the eyes of science will be the eyes of oil, and they'll be focused on Guadalupe Island. We've learned a great deal these past few years about what lies above; now it's time for a look below. The Mohole, when it comes, might well reveal much more than anything that ever said farewell at Cape Canaveral.

Save on oil exploration and production costs with '61 FORD TRUCKS

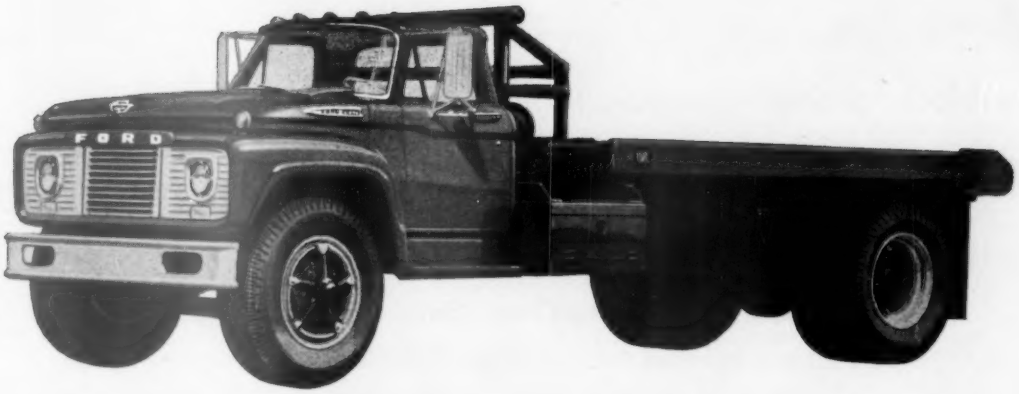
FORD HEAVIES SAVE WITH DOUBLE THE CAB, SHEET METAL AND RADIATOR LIFE

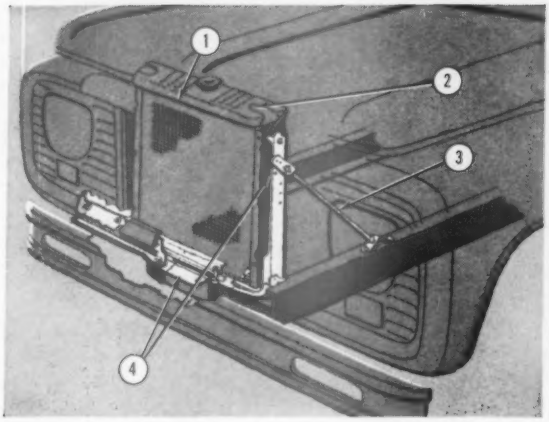
Ford F-Series Heavy Duty models are especially designed for the rugged terrain and tough conditions generally found on exploration and production jobs. Their new independent mounting system for cab and radiator effectively separates both from the adjacent sheet metal assemblies for much greater durability. And radius rod-leaf type rear springs provide better axle alignment, longer spring life.

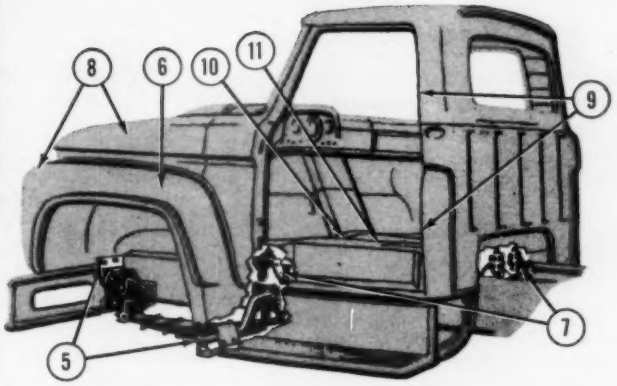
The electrical wiring system has been improved for greater reliability. Chassis wiring is fastened within the protection of the frame web, away from mud, ice and snow. Ford Truck frames have been engineered to make the mounting of bodies and special equipment easier. And a new 212-inch wheelbase model is available to accommodate extra-long bodies.

Save with Ford Heavy Duty Tandems for exceptional durability, payloads and low operating expenses. Ford T-700, T-750 and T-800 Tandems with HD V-8 engines have rugged double-channel frames that are built to take tortuous off-road treatment. And they provide a wider range of chassis options so you can choose the right power train and load-carrying components for any job. Eaton and Timken rear axles are now available in bogie assemblies with 22,000-, 28,000-, 30,000- and 34,000-lb. capacities. And lightweight aluminum walking beams, wheels and gas tanks are available to keep chassis weights low . . . payloads high.

Ask your Ford Dealer about Ford's full tandem line . . . including Super Duties with 38,000-lb. bogies for up to 51,000-lb. GVW!







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(5) **Save with independent fender mountings.** Fenders are bolted to a rubber-cushioned transverse bracket at the front and a frame-mounted bracket at the rear. This mounting, independent of both cab and radiator, eliminates stress transfers for greatly increased fender life.

(6) **Save with removable fenders.** The quick and easy removal of only 8 bolts per fender provides faster service accessibility to the engine area, saving valuable maintenance time.

(7) **Save with new 3-point cab mounting system** for greater cab durability. Two outboard front mounts plus a centered "twin" rear mount provide a triangular system that holds the cab stationary while allowing the frame to move independently . . . reducing strain on the cab.

(8) **Save with 42% heavier-gauge sheet metal** in fenders, hood, cab floor pan and toeboard for greater strength, greater durability.

(9) **Save with stronger cab construction.** New full-length door pillar reinforcements provide increased cab rigidity, stamina.

(10) **Save with a more solid foundation.** 42% thicker sheet metal is used in the integral floor pan and toeboard, this with added floor reinforcements gives a stronger base for longer cab life.

(11) **Save with new transmission access panel** to cut transmission service time.

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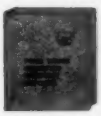

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FORD DIVISION, Ford Motor Company

Shallow drilling,

large blocks prompt operators to . . .

Check Chama basin

The northern portion of the Chama basin is experiencing a wildcat play largely because the lure of good shallow production intrigues operators who hold acreage.

BY KENNETH CHASTEEN
Albuquerque

A LARGE acreage block, the possibility of shallow production, and a big dose of that old and almost forgotten rank wildcatting spirit has revived exploration and interest in the Chama basin of Rio Arriba County, New Mexico and Archuleta County, Colorado.

Great American Oil Corp. of Albuquerque is trying to define a Morrison - Jurassic gas - producing area in the southwestern quadrant of the basin. Discovery was the Great American 1 Sargent, 4-1s-2e of the Mortin and Border Survey of the Tierra Amarillo Land Grant in northeastern Rio Arriba County, New Mexico and southeastern Archuleta County, Colorado. This location corresponds with what would be USGS 19-31n-3e. Great American holds 19,517 acres around the discovery. Surface geology and magnetometer survey preceded the drill.

Johney Meyers Drilling Co. of Farmington, N. M. drilled the well to total depth 1,401 ft. after a successful Halliburton drill-stem test of the Morrison formation between 900 and 950 ft. The test tool opened with a strong blow and surfaced gas in 2 minutes. No gage was taken, but estimates vary from 500 M.c.f. to over 1 M.M.c.f.d. of gas. Recovery was 200 ft. of gas-cut mud, flow pressure ranged from 63 to 89 psi., and final shut-in pressure measured 321 psi. in 30 minutes. Final hydrostatic mud pressure was 484 lb. on the 90-minute test.

A string of 5½-in. production casing was set to 1,022 ft. Ground elevation is 7,929 ft., with top of the Dakota-Cretaceous sand called by electric log at 440 ft., Morrison at 600 ft., and Entrada-Jurassic at 1,394 ft.

Great American first opened the Morrison at 965-77 ft., but after 250 gal. of acid, only water was swabbed. Perforations were then made at 901½-16½ ft. and 931½-46½ ft. using a total of 60 bullets. After another 250 gal. of acid, the well flowed to clean with a flow pressure of 50 psi.

The well has since been blown intermittently to clean drilling water from the hole. Even though a bentonite fillup problem has not allowed the well to flow as freely as it did on the drill-stem test, operators estimate a flow of 750 M.c.f. to 1 M.M.c.f.d. of gas. Oil has also begun to show as the well is blown and Great American will fracture the zone.

Retarded Exploration

Several factors have retarded exploration in the Chama basin, especially in the New Mexico portion. Probably the most important has been the control of a huge segment of this area by one estate.

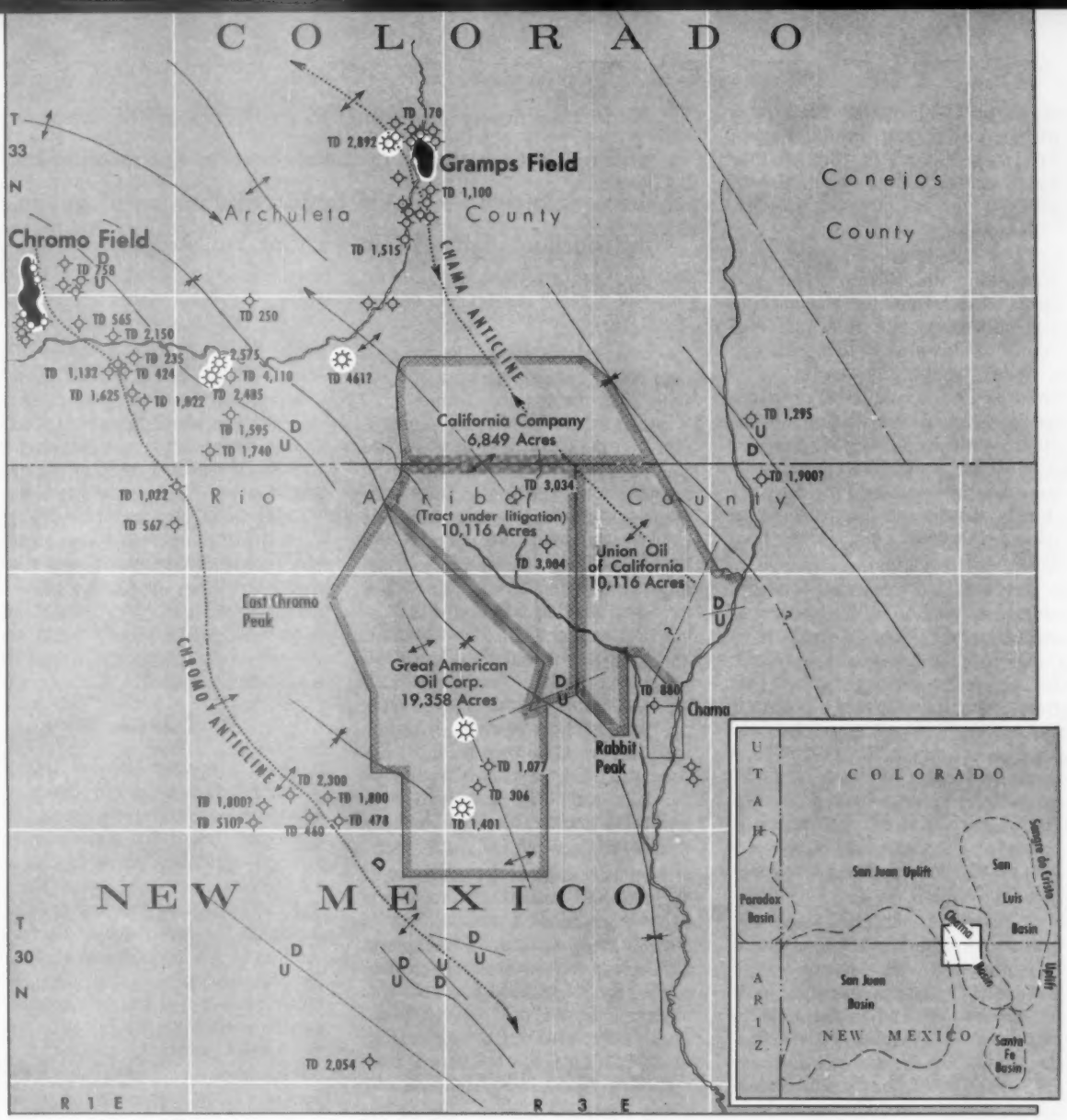
A total of 39,590 acres on the New Mexico side and 6,849 acres on the Colorado side of the basin is included in the Tierra Amarillo Grant now owned by the Sargent Estate. This acreage is broken into only four leases with The California Co. in control of the Colorado portion, Great American controlling the southwest 19,358 acres of the New Mexico acreage, and Union Oil Co. of California holding the northeast 10,116 acres. The middle 10,116 acres of the estate, separating Great American and Union leases and bordered on the north by the Colorado line and Calco acreage, is in litigation with N. O. Yeakley, the Sargent Estate, and Union Oil the interested parties.

Many geologists have held for years that production in Gramps field was the result of oil migration from the bulk of the basin up against the Price anticline (or "Chama" anticline) and its vertical fault, and that the basin proper was surely the source of other such trapped production. But the extremely rugged terrain, bad weather a large part of the year, large acreage blocks, and uncooperative practices have definitely checked exploration.

Chama Basin Geology

A shallow basinal structure merging to the northwest with the much

"Several factors have retarded exploration in the Chama basin, especially in the New Mexico portion. Probably the most important has been the control of a huge segment of this area by one estate."



STRUCTURAL FEATURES and producing sectors of Chama basin are highlighted in this map. Although numerous dry holes have been drilled, the density is not great considering the total number of tests in this area of 600 sq. miles. Yet the map represents less than half of the entire basin.

larger San Juan basin, Chama basin lies roughly divided by the Colorado-New Mexico state line.

Boundaries are: the Gallina Mountains, Capulin Mesa, and northward extension of the Nacimiento-San Pedro uplift on the west, the Jemez plateau on the south, the Abiquiu El Rito embayment of the Rio Grande trough on the southeast, and the Brazos uplift on the northeast.

Lying in a reentrant between the Rio Grande trough to the east and west and the northward extension of the Nacimiento uplift to the west, it is filled with late Paleozoic and Mesozoic sediments. Pennsylvanian, Permian, Triassic, Jurassic, Cretaceous, Tertiary, Igneous, and Quaternary rocks are present, and in fact, outcrop in many places over the mountainous area.

The basin contains many short faults with relatively small displacement as well as several major faults and is separated from the San Juan basin by a low sill which marks the position of the Archuleta arch.

Exploration History

Over the past 59 years, Chama basin exploration has been very limited. Depths of wells drilled range from 235 ft. to 4,850 ft. Deepest was Skelly Oil Co. 1 Crittender in 36-24n-1e in which Pennsylvanian was called at 3.500 ft.

Oil shows have been reported at various intervals ranging from as shallow as 90 ft. on the Horse Lake anticline to the Dakota at 1,060 ft. on the Azotea anticline. The Dakota, however, has proved to be a water-carrying sand in most of the wells drilled so far. Oil seepage is a common occurrence in the basin and, in many instances, outcrops contain residue and petroleum odors.

Exploration of the basin actually

began in 1901 on the heels of a published report in the Pagosa Springs (Colorado) Sun. Arthur Lake was the source of "A Report on Oil Fields in Archuleta County, Colorado."

Lake noted oil seepage at that time along the Navajo River east of the Chromo anticline (a condition that still exists and in which old-timers in the area note no change to date). That same year a B. T. Smith drilled a minute oil producer on the Little Blanco River and another southeast of Pagosa Springs. It must be noted that these wells were of the seepage type to very shallow depths and do not show up on any present-day maps of the area as oil wells.

The next 34 years saw little exploration, but in 1935 a well was drilled on the Price (Chama) anticline just 3½ miles north of the Navajo River seepage area. This resulted in the discovery of Gramps Dakota oil field. Although the field consists of only 127 productive acres, an average pay section of 152 ft. in the wells has yielded about 5 million barrels of oil. Production is limited to the south side of an east-west fault across the north-south anticlinal axis.

This field is entirely owned and operated by the Hughes Estate and information was not released until 1946. A very comprehensive report on it was published in the Bulletin of the AAPG, Vol. 30, No. 4. Production at the time was already 2,124,202 bbl. from the 16 producing wells. Most of the wells have since been deepened into the Morrison and are producing from combined Dakota and Morrison zones. All wells are on the pump and have been from the beginning.

In 1947, Florence Drilling Co. opened oil production on the Chromo anticline from fractured Mancos-Cretaceous shale. Pay varies from 400 to 700 ft. and up to January 1, 1959, about 120,620 bbl. of cumulative production was on record. Fourteen wells have produced or are producing in the field. All are on the west side of the anticline, perhaps suggesting another vertival fault as in the case of Gramps.

"One peculiarity confusing to explorers in the Chama basin — but which will probably tend to encourage further exploration — is the apparent absence of gas in the portion of the basin east of the Archuleta anticlinorium."

Most recent significant exploration on the Colorado side of the basin was the Yeakley 1 Crowley in Section 7-32n-2e of Archuleta County. Although never officially completed, this well made 762 M.c.f.d. of gas naturally from an interval between 1,400 and 1,500 ft. on a Southern Union Gas Co. gage. It was deepened to 2,485 ft. and a pump installed for some 30 bbl. of oil per day. Pump is still on the well, but no oil has moved from the lease due to past and pending legal action. Gas from the well has been used for the past 12 years by the landowner for household fuel. Wellhead pressure on the Southern Union test was 335 psi.

A quarter-mile offset bottomed at 4,110 ft. and was called dry. A 461-ft. Mesaverde well was drilled in Section 10 of the same township and although gas flow was never officially gaged, wellhead pressure was measured at 25 psi. At 1,625 ft., Phillips Petroleum Co. exploration in 12-32n-1e was abandoned after recording 14 oil and gas shows.

On the New Mexico side of the basin, exploration was limited to 18 wells, all dry, before the Gramps discovery. Only eight tests were drilled during the 12-year interval between the Gramps and Chromo discoveries. This was due principally to the highly secretive development and operation of Gramps field. After information was released on that area in 1946, about 21 exploratory tests had been drilled in the New Mexico portion of the basin until the current activity by Great American. These also were dry.

"On the New Mexico side of the basin, exploration was limited to 18 wells, all dry, before the Gramps discovery."

Authoritative sources agree that structural and stratigraphic conditions in the basin are favorable to oil occurrence. Additional fractured Mancos shale areas are expected to be found and even though the Dakota has been predominantly water-bearing in all exploratory wells except the Gramps producers, some pay is expected to be found from this information in fault-bounded or closed structures. Very few tests have cut pre-Dakota rocks and deeper zones in the basin must be considered untested.

Outlook

Great American has just finished its first attempt to pin down its Morrison gas-producing areas. The 2 Sargent was drilled slightly across a small anticline, which bisects its 19,517-acre holdings, from the 1 well. This second venture ran 205 ft. low at the top of Morrison from the 1 and was abandoned at 1,077 ft. Morrison was called from the electric log at 640 ft. from a ground elevation of 7,764 ft. Location was 1¼ miles northeast of the 1 in 33-1n-2e of the Mortin & Border Survey. Great American has announced immediate plans to step back across its anticline to drill 3 Sargent. Location will be approximately 1¼ miles northwest of its discovery well in 32-1n-2e of the M&B Survey.

Union Oil Co. of California is currently conducting seismograph work on its disputed acreage and magnetometer work is still going on in the basin. Interest in Chama basin has been aided by the recent discovery of an oil-producing field by Intex Oil Co. in 26s-1e of the regular USGS survey of New Mexico. Now almost a year old, this southeastern Rio Arriba County field has two pays, Sanastee and Greenhorn (Cretaceous), and almost a dozen producing wells.

New Mexico oilmen are about evenly divided as to whether or not

this producing area lies within the southeastern part of the San Juan basin or within the southwest quadrant of the Chama basin. The writer leans to the San Juan basin theory on the basis of the recently published Eleventh Annual Field Trip Guidebook of the New Mexico Geological Society. There is, however, a spillover of interest and, due to the rugged country, and overlap of exploration can also be expected.

One peculiarity confusing to explorers in the Chama bisin—but which will probably tend to encourage further exploration—is the apparent absence of gas in the portion of the basin east of the Archuleta anticlinorium, which bisects the basin on a northwestwardly direction. While gas has now been proved on the west not only by the Great American discovery but the Yeakley wells in Archuleta County, numerous shows in other wells, on the east side, the prolific Gramps field is completely void of gas and other exploration wells on this side have not shown gas. Since most parties believe the Gramps area was filled and is still filling from the basin proper, a block is implied between the portions of the basin. Gramps and Chromo fields, although separated by the Archuleta anticlinorium, have the same type of oil, even though from different formations. This would lend credit to the theory that sediments in the entire basin are of the same age. Multifaulting, probably brought on by the last actions of the Archuleta anticlinorium, are therefore credited with the apparent separation of the basin segments.

The Immediate Future

Great American Oil Corp. will continue its efforts on the Sargent Estate. Work will be spurred by the necessity of establishing reserves of gas to lure a pipeline connection. The two nearest are El Paso Natural Gas Co. at Dulce,, 25 miles west of Great American's discovery, and Colorado Public Service Co. at Pagosa Springs, 50 miles north of the discovery.

There is also a possibility of opening an oil field. Exploratory wells to at least Pennsylvanian rocks will be drilled by Great American during 1961, unless a shallow oil field is found and development in it overrides deeper exploration for a while.

With the Great American discovery, speedier action should come on the disputed 10,116 acres adjoining it to the east. Union Oil will surely begin tests on its acreage during 1961 and, if The California Co. holds to its present pace of exploration in southwestern Colorado, it too should get around to some sort of evaluation exploration during the next year.

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Great American Oil Corp., Albuquerque.

Canada's "Cardium alley" made '60 news

In 1960, "Cardium Alley," a few miles north of Calgary, would have to be considered one of the most important oil-exploration and development regions in Alberta, and the Celibeta Lake-Northwest Territories gas strike the most outstanding well and play in the gas category.

British Columbia had new gas discoveries in the Komie Creek, Beaver River, and Pocketknife areas to name a few, and Alberta operations uncovered a multizone producer in the Knappen district as well as a shallow-depth Mississippian gas in the Wildhorse Creek region of the province's Foothills.

Although the Crossfield "Cardium Alley" trend was indicated by exploratory drilling in 1959 it was during 1960 that the trend was actually developed. Recent drilling has given further indication of southern extension of the trend and if and when the blank spots are drilled with success between the southern and present northern limits there will be a 35-mile-long production area. The field that is 1½ miles wide runs almost parallel to the Cremona Pipe Line.

The three main gas discoveries in British Columbia, Beaver River, Komie Creek, and Pocketknife—will all require further testing before their actual worth is known. Beaver River, a Pan American Petroleum Corp. wildcat, was started in 1958 and suspended after a blow and fire. The original discovery in the 8,520-ft. level was supplemented in 1960 by a new strike at 11,425 ft. The Komie Creek discovery, also a Pan American venture, was temporarily out of control when gas unloaded drill pipe and blew at a sizable rate from the Slave Point horizon. The well, however, was controlled without much damage and now stands cased and suspended. The Pocketknife strike could prove to be an important gas source as this Mississippian strike was drilled on a huge visible anticline that runs in a northwest-to-southeast direction and extends for some 20 miles. Flow rate on test was better than 7 M.M.c.f.d.

Journal Improvements

Exploration articles can be read, clipped out, and filed with ease

TODAY'S ISSUE marks the third week for the Journal's larger type size and the new slotted binding.

Compare it with your 1960 issues to see how much easier the Journal is to read, handle, and clip.

For easier reading, the Journal has switched from the old 9-point type size to 10-point.

The old wire-stitch method of binding has been eliminated, causing the magazine to lie flat when open.

Pages can be torn out evenly and filed in ring notebooks because of the more ample margin.

The new method also makes it easier to bind entire volumes of the Journal.

These latest improvements are the result of long study and recent developments in binding methods and glues.

Mississippi discovery bagged in Kansas' Rice

Rice County in Kansas has a new Mississippi Chat discovery at Pure Oil Co. 1 Thode, C NE SE 26-21s-8w, 2 miles southeast of Sterling.

The new strike flowed 112 bbl. of oil in 13 hours through 11/64-in. choke from perforations at 3,354-59 ft. The confirmation well, 1 Culbertson, C NW SW 25-21s-8w, is still testing in the Mississippian Chat.

Morrow gas. A Morrow Pennsylvanian gas field was tapped in northeastern Clark County in the Dodge City basin area of southwestern Kansas.

Mobil Oil Co. 1 Cutter, C SW SE 1-31s-35w, 3 miles southeast of Hick field and 15 miles northeast of Hugoton townsite, flowed 3,500 M.c.f.d. during tests of the Morrow at 5,178-5,207 ft.

East Kentucky wildcat plugged and abandoned

In Madison County, Kentucky, a deep wildcat has been plugged and abandoned. Kentucky Drilling & Operating Company 1 R. R. Snowden, 7,600 ft. FSL and 11,100 ft. FWL of N-65, topped St. Peter Ordovician) sand at 1,717 ft. and Knox dolomite at 1,765 ft. Test was carried to a total depth of 2,770 ft. Some shows of gas and oil were reported but not of commercial significance.

Devonian discovery finaled at Bear Den in North Dakota

A Devonian discovery is completed at Amerada Petroleum Corp. 3 Bear Den unit in NE NE 36-149n-96w, McKenzie County, Williston bason, North Dakota. The well flowed 172 bbl. of oil and 23 bbl. salt water in 19 hours from Duperow perforations at 11,284-11,314 ft.

Location is ½ mile south of Madison Mississippian production at Bear Den. There has been no drilling between the discover and Lost Bridge field which lies 3 miles south. Lost Bridge is also a Devonian discovery. The new strike takes on added interest due to the recent flurry of Devonian excitement that resulted from the Tule Creek discovery to the west in Montana.

North Dakota bags first Nisku production

First Nisku Devonian production for North Dakota is reported at a deep test in Charlson field, McKenzie County. Discovery well is Texaco Inc. 5 Garland in SW NE 6-153n-95w.

The well swabbed 116 bbl. of oil and 164 bbl. of water in 22 hours from Nisku perforations at 10,058-74 ft. Operator is installing pump. Total depth is 13,860 ft. Plugged back depth is 10,189 ft. with top of Nisku at 10,024 ft. and top of Duperow at 10,123 ft.

On swab tests of the Duperow at 10,266-10.332 ft. recovery was 80 bbl. of oil and 17 bbl. water in 17 hours. Nisku production is the state's first. It produces at Tule Creek in Roosevelt County, Montana. The Garland well of Texaco is the first well in Charlson to go into pre-Mississippian.

Clear Creek field. Skelly Oil Co. completed a big well in this McKenzie County field at 1 Anderson in SW NE 26-152n-96w. The well, an east extension, flowed 584 bbl. per day from Madison at 9,207-17 ft. It is one of the best wells yet in this field. Also completed was 1 Halvorsen, a north extension in C SW SW 23-152n-96w. It flowed 115 bbl. daily from Madison perforations at 9,136-48 and 9,170-90 ft.

New Mexico gets another Abo reef discovery

More Abo reef production is reported in Southeast New Mexico. Sunray Mid-Continent Oil Co. completed 1-X New Mexico-State, 8 miles south of Lovington in Lea County, flowing 545 bbl. of oil per day on 18/64-in. choke.

Perforations at 9,002-14, 9,017-19 and 9,024-62 ft. were made. Location is 1½ miles south of West Lovington field in 20-17s-36e.

Ohio's Rich Hill gets first gas producer

In Ohio, Mutual Oil & Gas Co. moved across the township line into the northeast corner of Rich Hill Township, Muskingum County, to complete the first Clinton gas producer in this township.

The 1 J. Fenton, Section 6, finaled at 2,790 M.c.f.d. after fracture with a 21-hour rock pressure of 920 psi. Natural gage was 692 M.c.f.d. from the pay at 4,549-57 ft.

Ohio offset completed

In Ohio, a second offset to pool opener, Charles Davis 1 O. F. Guenther in northwestern Plain Township, Wayne County, has been completed with a shut-in volume of 3,850 M.c.f.d.

Ohio Fuel Gas Co. 1 W. B. Schmid, Section 5, found the Clinton sand at 3,143-50 ft. with a natural gage of 5,121 M.c.f.d. Forty-eight-hour rock pressure was 915 psi.

Morrow producer finaled in Oklahoma Panhandle

A high-flowing Morrow Pennsylvanian gas well was completed in the deep area of Hugoton gas field, Texas County, Oklahoma Panhandle.

The new well is Peerless Oil & Gas Co. and Jake L. Hamon 1 Hoeme in S SE NW 20-4n-17eCM, southeasternmost corner of the deep producing area inside shallow Permian gas. The well flowed 32,700 M.c.f.d. and 6 bbl. condensate per million from perforations at 6,211-51 ft.

West Oklahoma Morrow discovery completed

An important Morrow Pennsylvanian gas-condensate discovery was finaled in western Oklahoma's Blaine County. The well is Texaco Inc. 1 Woodruff in C SW NE 4-15n-13w.

Flow was 7,210 M.c.f.d. and 336 bbl. condensate on 14/64-in. choke from perforations at 10,220-40 ft. Location is 9 miles west of South Watonga field. It lies in the remotely productive northern trench area of the Anadarko basin.

Marietta basin. In southern Oklahoma's Love County, A. D. Britton opened a new oil area 8 miles southwest of Marietta in the Marietta basin.

The 1 Smith-McGeehee, a remote wildcat discovery, C SE NE 25-8s-1e, flowed 239 bbl. of oil per day, natural, on 12/64-in. choke from perforations at 7,310-15 ft. The well lies just east of a bend in Red River near the Texas line.

Third producer added to Oklahoma's South Corn field

South Corn field in Cleveland County, Central Oklahoma, has its third producing oil well at Petroleum Inc. 1 Rucker in SW NW NW 13-9n-3w, southwest of the field discovery well.

The new producer flowed 7 bbl. of oil per hour through 14/64-in. choke from perforations in the Second Wilcox Ordovician sand at 9,634-42 ft.

Northeast Moore. A triple completion is reported in this Cleveland County field, extending it northeast. Petroleum Inc. 1 Juricek-B in C SE NE 18-10n-2w flowed 20 bbl. of oil daily through 10/64-in. choke from the Red Fork through perforations at 7,248-58 ft.; 12 bbl. per hour from the Bartlesville Pennsylvanian at 7,320-34 ft. on ¼-in. choke; 23 bbl. per hour from the Hunton Siluro - Devonian through 20/64-in. choke at 7,486-7,548 ft.

Haskell County. Three-zone production is indicated at an important Arkoma basin wildcat. Mobil Oil Co. 1 Quinton in C SE NE 11-7n, 19e flowed 2,600 M.c.f.d. at 2,501 ft., 9,500 M.c.f.d. from Spiro at 5,841 ft., and 1,760 M.c.f.d. from Cromwell at 6,295-6,336 ft.

Kingfisher County. Production is reported at nine new wells in the Dover-Hennessey sector of this busy county.

Jones & Pellow Oil Co. 1 Stinson-B, C NE NE 9-18n-7w, offsetting the discovery well northwest of North Dover field, flowed 480 bbl. per day through 24/64-in. choke from Manning Mississippian perforations at 7,031-64 ft. From Oswego at 6,517-78 ft. it flowed 120 bbl. daily through 20/64-in. choke.

In College Corner field, 1 Corrie-B, C SW NW 26-19n-6w, open hole at 6,799-6,834 ft., flowed 480 bbl. per day through 24/64-in. choke and 480 bbl. from Manning at 6,611-35 ft. on 20/64-in. choke. The 1 Gritz in C NE NW 22-19n-6w, same area, flowed 216 bbl. per day through ¾-in. choke from Meramac open hole at 6,809-37 ft. and 456 bbl. per day from Manning at 6,584-6,629 ft. through 30/64-in. choke.

Oklahoma activity is brisk and widespread

Harper Oil Co. opened a second pool in Kingfisher County at 1 O'Hern in C NE NW 16-18n-6w. The well flowed 62 bbl. of new oil in 3½ hours through ¾-in. choke from open hole in treated Mississippi lime at 6,424-6,525 ft. A drill-stem test in the Oswego at 6,055-6,100 ft. got 100 ft. oil. Location is east of North Dover field.

Hennessey. Shell Oil Co. has a triple-zone well at East Hennessey field. The 1 Thurlow in C NE NW 23-19n-6w flowed 224 bbl. of oil per day through 15/64-in. choke from Oswego at 6,162-76 ft., 219 bbl. per day from Manning at 6,519-50 ft. through 15/64-in. choke, and 192 bbl. per day from Mississippi open hole at 6,730-6,825 ft. through 14/64-in. choke.

Jones & Pellow Oil Co. extended a new pool northwest of North Dover at 1 Stinson-B in C NE NE 9-18n-7w. The well flowed 136 bbl. of new oil per hour and 17-25 bbl. per hour through 24/64-in. choke from perforations at 7,031-44 and 7,054-64 ft. in the Manning. Now operator is testing in Oswego at 6,517-26 and 6,571-78 ft.

At East Hennessey, Jones & Pellow 1 Shimanek-D, C NE NE 17-19n-6w, flowed 25 bbl. of oil per hour through open hole in the Mississippi at 6,879 - 6,910 ft. through 20/64-in. choke. Manning is being perforated for tests.

Blaine County. Three new wells will go down in Blaine County. Pan American Petroleum Corp. will drill 1 Worley unit in C SE NW 2-19n-11w, looking for Hunton at 9,000 ft. The 1 Reamse Unit-B, C NW SE 33-20n-11w, will go to 7,500 ft. for Chester. Perkina 1 Weber, SW NE SW 14-19n-11w, will drill to 7,900 ft.

Beaver County. Cabot Corp. 1-45 Barby in C SW NE 8-3n-27eCM, Mocane area, flowed 20 M.M.c.f.d. from Tonkawa Pennsylvanian sand at 5,425-45 ft.

Cleveland County. Lone Star Producing Co. dually completed 1 Sudik in C SW SW 5-10n-2w on the Cleveland County side of Oklahoma City field. The well flowed 194 bbl. of oil per day through 13/64-in. choke from Red Fork Pennsylvanian perforations at 6,773 - 69 ft. From upper Viola Ordovician at 7,240-46 ft. the well made 30 bbl. of oil per day through 18/64-in. choke.

Devonian confirmation well finaled in West Texas

The confirmation well to a recently opened Devonian pool in southwestern Dawson County, West Texas, flowed 456 bbl. of oil daily through choke. New confirmer is Ard Drilling Co. 1 J. R. Ernest, ½ mile west of 1 Dubose discovery.

Top of the Devonian was at 11,933 ft. Location is in League 2, Taylor CSL Survey, 10 miles southwest of Lamesa townsite.

First Abo producer. The first Abo reef discovery for Texas was completed officially last week, pumping 187 bbl. of 36.8°-gravity oil plus 2% water, per day. The well is Union Oil Co. of California 2-1 Jones Estate, 14 miles southwest of Denver City in northwestern Gaines County, West Texas.

The well is producing through perforations at 8,032-62 and 8,073-80 ft. Location is in Section 1, Block A-8, PSL Survey, surrounded by shallow production in Brown field. This discovery moves the famed New Mexico Abo trend across the line into Texas.

West Central Texas area hits Ellenburger

Ellenburger Cambro - Ordovician production is reported at a wildcat in north-central Nolan County in West Central Texas.

The discovery well is Antelope Gas Producing Co. 1 Adrian Estate, 9 miles southeast of Sweetwater in Section 55, Block 20, T&P Survey. The well flowed 153 bbl. of oil daily through a 15/64-in. choke on 2-in. tubing at 6,243 ft. Open hole in the Ellenburger is at 6,270-85 ft.

Mistake Strawn field. This field's second producer and north offset to the discovery was finaled flowing 127 bbl. per day through 10/64-in.

choke from perforations in the Strawn Pennsylvanian at 5,131-35 ft. The well is Sherwood B. Owens 2 C. W. Tipton, 2½ miles southwest of Trent. Location is in Section 43, Block 19, T&P Survey.

Coleman County. B. C. McMordie completed 1 Ludie Owen as a Cross-Cut gas-condensate discovery 4½ miles northwest of Webb in northeastern Coleman County. The well flowed 8 M.M.c.f.d. and 7½ bbl. condensate per million cubic feet.

North Canada due busy drilling season

ACTIVITY in the general Fort Chard-Fort Simpson district of Northwest Territories is on the increase and initial indications point to a very busy drilling season. Already announced in the region are a pair of follow-up tests to 1960's Celibeta Lake Slave Point gas discovery well, an exploratory test by Pan American Petroleum Corp., another wildcat evaluation by the Murphy Corp., of Eldorado, Ark., and a pair of exploratory wells to be operated by Imperial Oil Ltd.

All of this drilling will be Precambrian searching with the major horizon being the Slave Point reef of Middle Devonian. That Slave Point horizon has been the objective of a major search in the northeastern sector of British Columbia over the past two drilling seasons and has now spurred this current N.W.T. activity.

Most important of the newly announced tests will have to be accorded to the Home Oil Co., Ltd., program in the Celibeta Lake region. This firm drilled a pair of wildcat tests in the same district last year and early in 1960 found gas at one of them. The two new locations lie 2½ miles northwest and the same distance southwest of that strike.

That program is being carried out by Home Oil, Signal Oil of California, Kern County Land Co., Alminex, Ltd., and United Oils, Ltd., on a 1,224,000-acre tract acquired under farmout agreement from the team of Canada Southern Petroleums, Ltd., Magellan Petroleum Corp., and Oil Investments, Inc.

The Pan American site is 55 miles northwest of Fort Chard, 80 miles northwest of Home's discovery well and is the most westerly of all the sites scheduled to date. It is on a block of petroleum and natural-gas permits owned by Pan American which includes 18 separate tracts and rights to 1,100,000 acres. It is scheduled as an 8,000-ft. evaluation.

Murphy's location is the most easterly of those staked. Burmah Oil of Canada, Ltd.—a subsidiary of the Burmah Oil Co., Ltd., which has its head office in Glasgow, Scotland—has taken a half interest in the project and although not confirmed, it is understood that this is only the first of a multiwell program. This site is 55 miles north-northeast of the Celebita Lake discovery hole, 70 miles southwest of Fort Simpson and 75 miles north of B.C.'s Petitot River-Slave Point gas field.

The other two sites, both to be drilled by Imperial Oil Ltd., are close to the Murphy site and only

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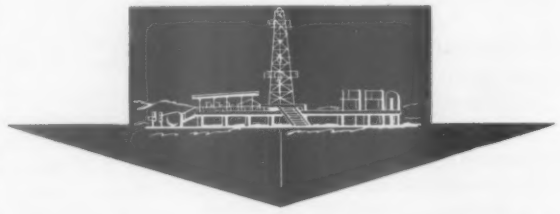

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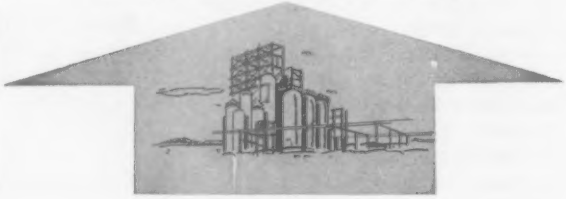

12 miles apart. Both of them are situated on a seven-permit farmout from the Sun Oil Co. That farmout includes a total of 437,974 acres and for drilling the tests, Imperial will earn an undisclosed interest in the rights.

Road-building operations are currently in progress to all the sites with the exception of the Home Signal-CSP 5 Celibeta venture on which rigging operations are in progress. The other Home venture, 6 Celibeta, was started after the New Year as will the other four.

Contractor on the Pan American A-1 Mattson No. 1 test has not been named and neither have those that will be used by Imperial on its Imperial Sun J-46 Arrowhead and Imperial-Sun D-7 Nepla tests. Brinkerhoff Drilling Co., Ltd., is contractor on the Home start; while Parker Drilling Co. of Canada, Ltd., will drill the Celibeta No. 6 test and Peter Bawden Drilling Co., Ltd., will use company-owned equipment on the Murphy site.

Discovery wells

WESTERN CANADA

Alberta:

Lloydminister Gas 6-34 Mannville, LSD 6, 34-50-8w4. Gas discovery. TD 2,020 ft.

Dome-Provo et al. 7-17 Patricia, LSD 7, 17-21-12w4. Basal Colorado gas discovery. TD 4,093 ft.

British Columbia:

McCoy et al. B-62B Bubbles, 62-B-94-G-8. Baldonnel gas discovery. TD 4,650 ft.

COLORADO

Moffat County, Danforth Hills:

Texaco Inc. 7 Government-Treleaven, NW NE 31-5n-95w. IPP 445 BOPD, 2.4 BWPD, TP 120 psi., CPO, 34-60°, Weber 8,123-82 ft. TD 11,762 ft. PBTD 8,285 ft. Weber discovery, new field.

Rio Blanco County, Douglas Creek West area:

Apache Corp. 1 Government-Watson, SE NW 10-2s-102w. IPF 298 M.c.f.d., Emery open hole 2,716-3,040 ft. TD 3,224 ft. Emery discovery, new field.

San Miguel County, Southeast Lisbon:

Pure Oil Co. 2 McIntyre Canyon unit, SW NW 8-44n-19w. IPF 6,716 M.c.f.d., 149 bbl. cond. per day, 36/64-in. choke, TP 1,215 psi., 50.4°, Ouray 8,821-62 ft. Mississippian 8,674-8,784 ft. TD 9,170 ft. PBTD 9,132 ft. Ouray discovery, new pay.

NEBRASKA

Kimball County:

Nebraska Drillers et al. 1 Dillon, OWWO, NW NW 18-12n-55w. IPP 40 BO, 70 BWPD, "J" sand 6,441-47 ft. TD 6,577 ft. PBTD 6,575 ft. "J" sand discovery, new field.

Morrill County:

Falcon-Seaboard Drilling Co. 1 Schaffert, SW SW 12-17n-52w. IPP 263 BOPD, "J" sand discovery, new field. TD 5,358 ft.

NEW MEXICO

Eddy County:

Wayne J. Spears 1 Kelly, 15 miles northeast of Carlsbad in 20-19s-30e. IPP 30 BO and 20 BW in 24 hours, 32°, Yates 1,674-1,703 and 1,708-29 ft. TD 1,787 ft. PBTD 1,750 ft. New oil discovery.

Texaco Inc. 1 Remuda Basin unit, 10 miles east of Loving in 24-23s-29e. IPF 72 BOPD, 2.5 BAWPD, 28/64-in. choke, 47°, GOR 3,333:1. TP 100 psi., CP 450 psi. Wolfcamp 11,111-80 ft. TD 15,141 ft. PBTD 13,335 ft. New oil discovery.

Rio Arriba County:

Great American 1 John Sargent, SE SW 1s-2e Section 4, unsurveyed. approx. 19-31n-3e. IPF 500 M.c.f.d., 1-in. choke, TP 85 psi., SICP 559 psi. Completed as shut-in gas well. TD 1,400 ft. First producer on New Mexico side of Chama basin.

San Juan County:

R & G Drilling Co. 47 Hammond, NE SW 35-27n-8w. IPF Mesaverde 860 M.c.f.d., 4,527-4,626 ft., IPF Dakota 1,727 M.c.f.d., ¾-in. chokes, Dakota 6,662-6,814 ft. CP 52 psi., SICP 1,135 psi., TP 115 psi., SITP 2,204 psi., SICP 2,216 psi. TD 6,838 ft. PBTD 6,824 ft. Dakota discovery, dual completion, new field opener.

Consolidated Oil & Gas Co. 1 Consolidated-Hale, NW NE 24-26n-8w. IPF Pictured Cliffs 773 M.c.f.d., 2,700-24 ft., IPF Dakota 3,090 M.c.f.d., 6,994-7,165 ft., ¾-in. chokes, SITP 759 psi., TP 46 psi., SICP 757 psi., TP 215 psi., SITP 2,382 psi. TD 7,242 ft. PBTD 7,210 ft. Dakota discovery, dual completion, new field.

WEST CENTRAL TEXAS

Jones County:

D. D. Strange 1 A. A. Hayden, OWWO, 2 miles north of Hawley in G. Martinez Sur. 195. IPP 80 BOPD, 37°, GOR 250:1. 2,024-30 ft. TD 2,088 ft. New oil discovery.

LEGAL

U. S. DEPARTMENT OF THE INTERIOR, Bureau of Land Management, Land Office, Cheyenne, Wyoming. Notice is hereby given that 5,328.38 acres of land in 49 parcels within the known geologic structures of a number of fields in Big Horn, Campbell, Fremont, Natrona and Washakie Counties, Wyoming, are offered for competitive oil and gas leasing through sealed bids to the qualified bidder of the highest cash amount per acre at 2:000 P.M., MST, March 8, 1961, when bids will be opened. Full details of the offering, and how and where to submit bids, may be obtained from the Land Office, Cheyenne, Wyoming. Arvin H. Olswold, Chief, Minerals Section.

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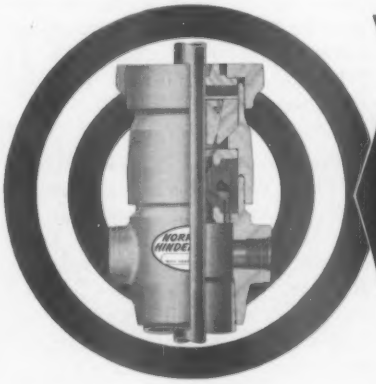
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Science Aided Shell's Spaght

. . . in his advance to presidency of the company. He says oil's future hinges on the application of new knowledge.

A SCIENTIST turned business man—Monroe E. Spaght's description of himself—is probably the most appropriate epithet that could be applied to the new president of Shell Oil Co.

A tall, handsome Californian of 51, with just the proper amount of gray at the temples to be termed distinguished, he looks every inch the head of a great corporation.

His scientific background pervades his management philosophy. (See interview, p. 56.) And, he believes it played no small role in his rise to the top position in Shell.

"I'm happy that I had a specialty, and that it was technical," he says. "In our type of business, scientific training is of greater comfort to one than any other thing I can think of."

His most valuable specific experience, he feels, was as president of Shell Development Co. "There is no substitute for the privilege of having your hand on the throttle all by yourself," he says. "The fact that it was a research operation is, I believe, incidental."

Spaght believes the future of the industry depends on its success in putting new knowledge to work. It is no surprise that he has been a pioneer in industry support of education.

His management philosophy includes such views as: "We must learn to live by our wits," and, "Our field of business activities should be limited only by our talent and brainpower."

Monroe E. Spaght
. . . new hand on the throttle.

Shell career . . . Spaght earned an AB degree in chemistry at the age of 19 and an MA the following year from Stanford University.

After a year's study under a fellowship at the University of Leipzig in Germany, he won a PhD degree in chemistry from Stanford.

He then began 13 years in Shell manufacturing operations beginning as a research chemist at the Martinez, Calif., refinery in 1933.

After transfer to the Wilmington-Dominguez, Calif., refinery in 1935, first as a technologist and later as manager of the technological department, he participated in Shell's early work in polymerization and hydrogenation.

In 1940 he was promoted to manager of technological activities of Shell's manufacturing operations on the West Coast, with headquarters in San Francisco. After 6 years in this job, during which he also performed several important government assignments related to petroleum, he began a rapid climb through the management hierarchy.

In 1946 he was named vice president of Shell Development Co., then president in 1949. In 1953 he became executive vice president of Shell Oil Co., in New York, the position he held until succeeding H. S. M. Burns as president on January 1.

Educational avocation . . . Spaght is a trustee of his alma mater and a director of the Stanford Research Institute and the Institute of International Education, which sponsored his Leipzig fellowship.

He is president of the Shell Companies Foundation, Inc., which has pioneered new programs in support of education, including fellowships for high school science and mathematics teachers.

▶▶▶ Personals

John C. Lamkin, Standard Oil Co. (Ind.), has been elected chairman of the American Chemical Society's Kansas City section.

Arthur S. Gale, Jr., Champlin Oil & Refining Co., has been elected president of Fort Worth Geological Society. Other new officers are **Raymond T. Stotler, Jr.,** Pan American Petroleum Corp., first vice president; **Jimmy D. Thompson,** Schlumberger Well Surveying Corp., second vice president; **Lewis Hayes Rogers,** Southland Royalty Co., secretary; and **Thomas C. Sturdivant,** Newmont Oil Co., treasurer.

L. R. (Dick) Peddicoart, Nelson W. Williams & Co., has been elected president of the Tri-State Association of Petroleum Engineers. Other officers include **Richard D. Hazen,** Barron Kidd, first vice president; **John Blue,** Superior Oil Co., second vice president; **R. F. Grimm,** Nelson Williams & Co., third vice president; **K. E. Barnett,** Sun Oil Co., secretary-treasurer; and **Ralph Hague,** Hague Equipment Co., Inc., publicity chairman.

Anthony Deddens, Bisbee, Ariz., attorney, has been appointed to a 1-year term as chairman of the Arizona Oil and Gas Conservation Commission. He succeeds **M. F. Wharton,** Phoenix, who becomes vice chairman.

Fred E. (Sam) Stickle, Stickle Drilling Co., has been elected chairman of American Association of Oilwell Drilling Contractors' Tulsa chapter. Other officers are **John H. Burgher,** Indian Drilling Co., vice chairman; and **F. B. Koontz, Jr.,** Loffland Brothers Co., secretary-treasurer.

Eugene J. Wilson has joined Alco Oil & Gas Corp. in Denver as geologist.

Ernest H. Babitzke, reservoir engineer for Texaco Inc. in Dallas, has been promoted to district petroleum engineer in Shreveport, La.

Willis W. Hardy, assistant to the manager of exploration for Mobil International Oil Co., has retired after 22 years with Socony Mobil companies.

Joseph A. Petrelli, Caribbean and Latin American adviser for marketing operations of Mobil International Oil Co., has been named manager of marketing and distribution for Socony Mobil Oil Co.'s engineering department. **John B. Merrell** has been named manager of analysis and controls for Mobil Oil Co.'s marketing department. He is also assistant for administration to Mobil's marketing vice president.

Carrol M. Bennett, of Bennett, Osborn & Hall, management consulting firm, has been named president of Frankfort Oil Co., a division of Joseph E. Seagram & Sons, Inc. Bennett's consulting firm has been supervising Frankfort operations since 1956. Bennett was with the old Vacuum Oil Co. and Magnolia Petroleum Co. at one time. In 1959, he resigned as vice president of Dallas Rupe & Son to become a consultant. His firm was retained by Iricon Agency, Ltd., which represents nine interests in the Iranian Consortium. Bennett served as a director of Iricon.

J. M. Cooper, assistant managing director of Kuwait Oil Co. in London, has retired. Cooper was production superintendent for Gulf Oil Corp. until 1949 when he moved to Kuwait Oil, which is partly owned by Gulf. He will continue as consultant to Gulf on Kuwait and Middle East matters. In recognition of his service to British interests, Cooper was appointed Honorary Commander of the British Empire by Queen Elizabeth before he left London.

Robert M. Shiels, petroleum engineer for Pan American Petroleum Corp. in Midland, Tex., has been promoted to production engineer with Pan American International Oil Corp. in New York.

J. L. McCulley, division manager in Montana for Continental Oil Co., has been promoted to assistant manager of marketing in the northern region, a new position. He will headquarter in Kansas City.

Kenneth D. Soule, district geologist in New Orleans for Pan American Petroleum Corp., has been named New Orleans district exploration superintendent. He succeeds **P. H. Garrison,** recently named Casper, Wyo., division exploration superintendent.

D. D. Gillespie has been named vice president of Fain-Porter Drilling Corp., Oklahoma City. Gillespie has been with Lazard Freres & Co., New York investment banking firm, and was division engineer for Pan American Petroleum Corp. at one time.

George W. Burgess has been named district manager in New Orleans for Kern County Land Co. He will head consolidated Louisiana and Mississippi exploration and production. **Donald G. Cook** has been named district manager in the Permian Basin district, Midland, Tex., and **John S. Baker** has been appointed Four Corners district manager in Albuquerque. The appointments are part of Kern County Land's reorganization of exploration and production activities in the Permian Basin, Four Corners, Louisiana, and Mississippi. Also, **Robert E. Horton,** Jackson, Miss., has been transferred to New Orleans as district geologist. The Jackson office has been closed. **James E. Grady** and **Justin Hall,** both of Monterey Oil Co., have joined Kern County Land in New Orleans. Grady will be district land man and Hall, geologist. **C. W. Braddy,** Albuquerque, has been transferred to Midland as district land man. **G. H. Castle, Jr.,** San Francisco, has been named Four Corners district land man, Albuquerque. **William May,** petroleum engineer, has been transferred to San Francisco from Bakersfield, Calif.

▶▶▶ Personals

Charles S. Agey, chief geologist for Amerada Petroleum Corp., has been named executive assistant. He will be succeeded as chief geologist by **J. W. Snider,** assistant chief geologist. **L. F. Meister** has retired as manager of the land department. He will be succeeded by **T. H. Humphreys,** assistant land manager since 1958. **J. E. Lynch** land man, has been named assistant land department manager. Agey has been with Amerada since 1935. He was manager of the Canadian division at Calgary before moving to Tulsa last year as chief geologist. Snider had been assistant chief geologist since 1957.

AGEY

D. W. Matthews, Kansas division production superintendent for Continental Oil Co., has been named superintendent of the Oklahoma production division in Oklahoma City. He succeeds **C. R. Wallen,** who has been transferred to Great Bend, Kans., to take Matthews' old post.

Thomas P. Simpson, general manager of engineering and operations analysis for Socony Mobil Oil Co., Inc., has retired after 35 years with the company. He was at one time a vice president of General Petroleum Corp. and later general manager of manufacturing for Socony.

Dr. R. L. Hellwig has been named manager of planning for Cities Service Research & Development Co. **Dr. John J. Hawkins** has been named head of the organic-research division and **Charles R. Byrd** has been named staff engineer in the planning division. **Jack Newcombe** will be technical staff assistant. **Dr. F. T. Wadsworth** has been named manager of the petrochemical laboratory. Within the laboratory, **C. W. Hack** has been named head of the engineer division: **Adolph C. Shotts** has been named section supervisor, analytical division; and **Dr. R. F. Clark** has been named chemicals-section supervisor.

Personals

Howard B. Noyes has been elected vice president for gas procurement by Columbia Gas System Service Corp. He succeeds **Irving K. Peck,** who has retired after 25 years with the company. Noyes will be responsible for obtaining new natural-gas reserves for the company in the Southwest. He will headquarter in Houston. Noyes was senior vice president of Washington Gas Light Co. before joining Columbia Gas in 1958.

NOYES

J. M. Jastrow, division land man in Midland, Tex., for Phillips Petroleum Co., has joined Mesa Pipeline Co., Midland, as vice president and a director.

Vaughn E. Roberts, general foreman for Marathon Pipe Line Co. in Greybull, Wyo., has been transferred to Casper, Wyo., on a temporary assignment as safety engineer. Roberts later will be named inspector on the new Libyan crude line being built by Oasis Oil Co. Marathon and Oasis are affiliates of Ohio Oil Co.

P. J. Gormely, area supervisor for Union Carbide Chemicals Co. in Texas City, has been named superintendent of Seadrift Pipeline Corp., Union Carbide subsidiary. The pipeline company connects Union Carbide's Brownsville, Seadrift, and Texas City plants with gas and products lines. Gormely will continue to headquarter in Texas City.

Walter Wendlandt, examiner with the Texas Railroad Commission, has been named director of the commission's gas-utilities division. He succeeds **S. C. McIntosh,** who retires January 31.

W. Dow Hamm, vice president and general manager of Atlantic Refining Co.'s crude-oil production department, has been elected a director. He will succeed **L. A. Sunkel** on the board. Sunkel retires February 1 after 42 years with Atlantic.

Robert E. Zinkham has joined Gulf Research & Development Co.'s production-engineering division as research engineer.

James E. Gilchrist, Humble Oil & Refining Co. engineering trainee in Purcell, Okla., has been assigned as engineer in St. Elmo, Ill.

R. C. Watts, district superintendent for Amerada Petroleum Corp. in Duncan, Okla., has been transferred to Casper, Wyo., as district superintendent of production.

Maurice F. Oxenreiter has been named group leader at American Oil Co.'s Whiting, Ind., laboratories. His group will evaluate economic aspects of new refining processes. He has been with the Standard Oil Co. (Ind.) companies since 1952.

Glenn L. Werly, Mobil Oil Co.'s marketing general manager in New York, has been named special assistant to the vice president for marketing. **G. Albert Klaffky,** resale programs manager, has been named manager of the new market-development group.

J. H. Laws has been named plant superintendent of the industrial-chemicals division at Shell Chemical Co.'s Houston plant. He succeeds **C. H. Plomteaux,** recently named manager of the Shell Point plant, Pittsburg, Calif. **W. A. Gabig,** assistant chief engineer, maintenance, in the industrial-chemicals division, Houston, will succeed Laws as assistant superintendent, operations. **K. F. Behrens,** area engineer in the industrial-chemicals division at Shell's Norco, La., plant, will succeed Gabig.

Six new members have been named to National Petroleum Council bringing total membership to 111. The new members are **Perry Bass,** Fort Worth; **Paul N. Howell,** San Antonio, Tex.; **Harry A. Jackson,** American Petrofina, New York; **Don H. Miller,** Skelly Oil Co., Tulsa; **Monroe E. Spaght,** Shell Oil Co., New York; and **Richard L. Vockel,** Waverly Oil Works Co., Pittsburgh. The other 105 members will be holdovers from last year except that oil trade associations who have changed presidents will send their new president to the council.

R. R. Williams has been appointed Canadian exploration manager for Canadian Bishop Oil, Ltd.

Robert W. Miller, chairman of Pacific Lighting Corp., has resigned as a director of Standard Oil Co. of California.

Robert A. Prusinski, general superintendent of Trans-Arabian Pipe Line Co., in Saudi Arabia, has been named manager of operations. He succeeds **Dallas T. Pinckney,** who has retired. Pinckney will open consulting offices in Berkeley, Calif.

Bill Ashcraft, of Union Carbide Chemicals Co.'s Texas City plant, has been given a loan assignment with Union Carbide International in Japan. He will work with design of the new polyethylene plant UCI is building near Tokyo with Nitto Chemical, a Japanese firm.

W. F. Kienast and **A. W. Chandler** are the two new members of the general committee of the Southwestern Gas Measurement Short Course. Kienast is superintendent of measurement for Houston Corp., Houston Texas Gas & Oil Corp. and Coastal Transmission Co. Chandler is owner of Chandler Engineering Co., Tulsa. The 1961 course will be held on the North Campus of the University of Oklahoma, Norman, April 18-20.

CHANDLER

KIENAST

R. K. W. McCoy has been named manager of transportation and supply in Murphy Corp.'s River States Oil division. Other managers in this division include **Frank McCraken,** wholesale sales; **Jim Smith,** retail sales; and **Dave Allen,** operations. **John Brown** will continue as manager of Murphy's Superior, Wis., refinery. The appointments follow Murphy's merger of its subsidiaries, Lake Superior Refining Co., and River States Oil Co., into the parent company.

Personals

Raymond O. Courtright, Jr., has joined W. E. Stiles Engineering, Inc., Tulsa consulting firm, as manager of Petrorep drilling and production operations in Paris. Stiles recently was hired by Petrorep to provide full-time engineering and supervision of the company's drilling, completion, and producing operations. Principal Petrorep production is in the Paris Basin area. **Richard W. Coburn,** Stiles vice president, had been handling the Paris assignment on a temporary basis.

COURTRIGHT

B. J. Sinex, assistant district superintendent for Amerada Petroleum Corp. in Williston, N. D., has been promoted to district superintendent in Oklahoma City.

E. S. Parker, northern California division geologist for Standard Oil Co. of California in Bakersfield, Calif., has been transferred to Anchorage as district exploration superintendent. **P. W. Gester,** former Anchorage district exploration superintendent, will succeed Parker in Bakersfield.

Louis Mittelman, superintendent of technology for Tidewater Oil Co. in Martinez, Calif., has retired after 39 years with the company.

Clyde Parker has been promoted to district exploration manager for Cities Service Petroleum Co. in Midland, Tex. He had been district land man in Amarillo, Tex.

Jack Maness, senior process engineer for Kerr-McGee Oil Industries, Inc., in Wynnewood, Okla., has been named chief process engineer in Cushing, Okla.

Dr. Frank L. Stanonis, area geologist for Humble Oil & Refining Co. in Pittsburgh, has joined George A. Hoffman, Henderson, Ky., producer, as geologist.

Martin G. McAndrews, San Joaquin division stratigrapher for Shell Oil Co. in Bakersfield, Calif., has been transferred to Farmington, N. M., as Four Corners division geologist.

Charles W. Hickok, project engineer in Dewey, Okla., for Oil Recovery Corp., has been named assistant manager of production. **H. J. Ramsay, Jr.,** evaluation engineer, has been named assistant manager of engineering. Both will headquarter in Tulsa. **L. A. Hampton,** formerly plant engineer at the company's Dewey plant, has been named chief mechanical engineer in Tulsa. **W. D. Granberry,** petroleum engineer in Dewey, has been named evaluation engineer, Tulsa.

HICKOK

RAMSAY

Kenneth Hunt, laboratories manager for Esso Research, Ltd., has been named by Esso Petroleum Co., Ltd., to the new position of research and development adviser.

Deaths

Tom P. Walker, 69, former president and chairman of Transcontinental Gas Pipe Corp., died January 10 in Houston of a heart ailment. Walker was vice president of Irving Trust Co., New York, before becoming Transco president in 1953. He served a year as Transco chairman in 1957 and was a director at the time of his death.

Russell M. Riggins, 66, president of Texas Gas Corp., died January 9 in Houston. A former Phillips Petroleum Co. official, he became president of McCarthy Chemical Corp. and New Ulm Corp. in 1951. Texas Gas developed out of New Ulm.

Paul E. Fitzgerald, 57, public relations manager for Dow Chemical Co.'s Dowell division in Tulsa, died January 7 in a Tulsa hospital of cancer. Fitzgerald was at one time manager for Dowell in the Rocky Mountains and western Canada and had also served in California and Mexico. He took over the public relations post in 1952.

Ernest Utterback, retired manager of the design division in Socony Mobil Oil Co.'s engineering department, died December 29 in La Mesa, Calif.

Thomas A. Mitchell, 55, owner of Thomas Mitchell Drilling Co., died December 30 in a St. Louis hospital.

Sebastian A. Slagel, chairman of Cumberland Petroleum Co., Cleveland, died December 22 in a Cleveland hospital.

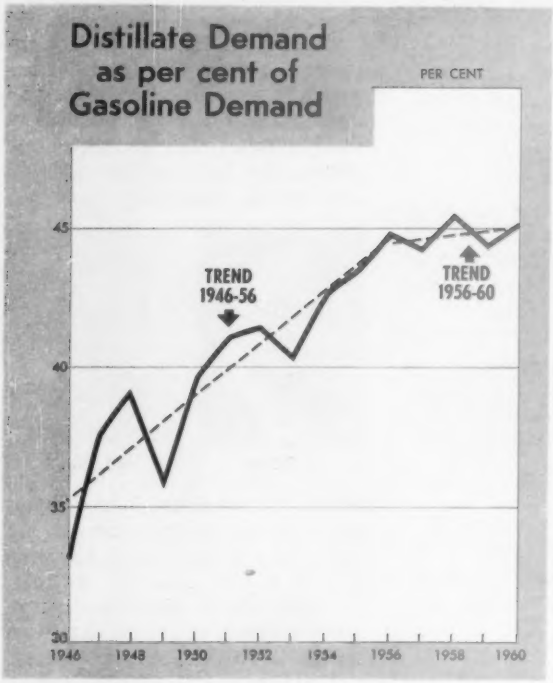
John Clyde Fowler, owner of Cly-Roy Oil Co., Bartlesville, Okla., died January 9 in a Bartlesville hospital. Fowler had been an independent operator in the Bartlesville area since 1905.

William John Caldwell, 76, retired engineer in the pipeline division of Standard Oil Co. of California, died January 5 in a Bakersfield, Calif., hospital.

Hubert Thornton Bratcher, 60, superintendent of production for Cosden Petroleum Corp., Big Spring, Tex., died recently in a Hobbs, N. M., hospital of a heart ailment. Bratcher was in Hobbs on a business trip when he became ill.

Edward S. Holt, 67, retired president of Utah Oil Refining Co., died December 31 in Salt Lake City of a heart ailment.

Walter Joseph Allen, 70, geologist with the old Deep Rock Oil Corp., died January 11 in Tulsa after a heart attack. Allen retired in 1956. He was with the old Wolverine Oil Co. and Shaffer Oil & Refining Co. before joining Deep Rock.



PLOTTED POINTS represent distillate demand as per cent of gasoline demand each year. Note the sharp change in the line after 1956. Broken lines show calculated trends for periods before and after 1956.

Shifting demands bring new yield pattern

BY JOHN C. CASPER

DISTILLATE DEMAND is still gaining on gasoline, but the gain rate is slowing down. The change has been due to smaller increases in distillate sales rather than to any rapid advance by gasoline.

The break in the upward trend came sometime about 1956. In the period from 1946 through 1956, the trend shows distillate picking up almost one percentage point a year on gasoline. There were sharp gains and losses during the period but the calculated trend shows an average annual gain of 0.961%.

Note that the curve has tended to level out in recent years. For the 1956-60 period the average yearly increase was about 0.09%. A comparison of these trends shows that distillate was gaining on gasoline about 10 times as fast in the 1946-56 period as in the 1956-60 years.

If gains had continued at the old rate, distillate demand would have been up to half gasoline demand by 1962.

Distillate's rapid rise in the early postwar period was due to big increases for home heating. Sales of distillate for heating increased 75% in the 5-year period from 1946 to 1951. There was another gain of about 100 million barrels per year between 1951 and 1956.

Gas Availability Restricts Heating-Distillate Sales

In recent years, increased availability of natural gas in northern and eastern states has restricted sales of distillate for home heating. Refiners are no longer increasing the distillate cut from a barrel of crude.

Distillate accounted for 16.6% of products from the average barrel of crude in 1946. Yield was up to 22.9% by 1956 and reached an all-time peak in 1957 with 23.1%. For the first 10 months of 1960, the Bureau of Mines reported the average yield at 22.3%.

Any further slowdown in development of the home-heating market for distillate will require additional shifts in refiners' yield pattern.

Reductions in yield of distillate from the average barrel of crude will be offset by higher yields of gasoline and jet fuels.

Since gasoline brings a higher price than distillate, there will be a trend toward increased realization from the average barrel of crude. Realization will be up, but annual gains in refinery runs will be much less than for the early postwar years. The sixties will be a period of change for refiners.

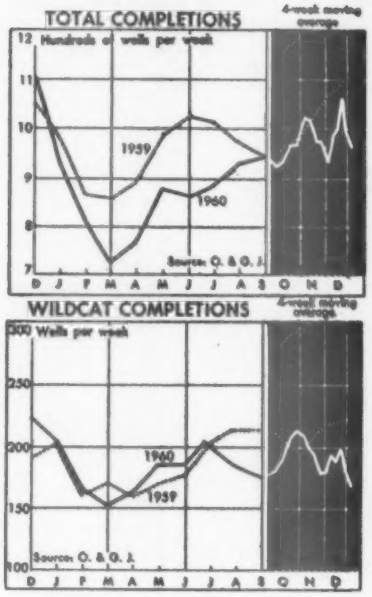
A quick look at the highlights . . .

	LATEST WEEK	Change from WEEK AGO		Change from YEAR AGO	
Production	7,154,095	DOWN	12,080	DOWN	67,371
Crude stocks	238,732,000	UP	1,800,000	DOWN	14,168,000
Completions	1,035	UP	391	UP	104
Refinery runs	8,167,000	DOWN	78,000	DOWN	229,000
Gasoline stocks	199,925,000	UP	4,222,000	UP	5,977,000
Kerosine stocks	30,844,000	DOWN	1,204,000	UP	3,992,000
Distillate stocks	135,232,000	DOWN	7,014,000	DOWN	8,902,000
Residual stocks	40,991,000	DOWN	1,101,000	DOWN	7,367,000
Four-product stocks	410,992,000	DOWN	5,097,000	DOWN	6,300,000
Total imports	1,948,300	UP	87,900	UP	239,000

DOMESTIC DEMAND FOR DISTILLATE AS PER CENT OF GASOLINE DEMAND

	Gasoline demand	Distillate demand	Ratio (Per cent)
1946	2,015	665	33.0
1947	2,178	817	37.5
1948	2,381	931	39.1
1949	2,503	902	36.0
1950	2,724	1,080	39.7
1951	2,992	1,230	41.1
1952	3,162	1,310	41.4
1953	3,303	1,337	40.5
1954	3,371	1,442	42.8
1955	3,655	1,592	43.6
1956	3,752	1,683	44.9
1957	3,816	1,688	44.2
1958	3,934	1,790	45.5
1959	4,067	1,808	44.5
1960	4,128	1,866	45.2

Active Rotary Rigs



	1-9-61	1-2-61	1-11-60
Alabama	7	6	5
Alaska	7	7	(†)
Arkansas	13	10	13
Arizona	1	1	0
California	79	84	77
Land	75	80	70
Offshore	4	4	7
Colorado	31	28	34
Florida	5	5	2
Land	3	2	2
Offshore	2	3	0
Georgia	2	0	0
Illinois	21	26	26
Indiana	9	13	2
Kansas	98	117	117
Kentucky	4	3	8
Louisiana	258	273	277
North	28	35	32
S. Inland waters	92	95	104
S. Land	89	94	89
Offshore	49	49	52
Michigan	27	24	36
Mississippi	47	53	70
Missouri	0	0	1
Montana	32	27	20
Nebraska	14	17	19
Nevada	1	1	0
New Mexico	101	102	96
New York	1	1	0
North Dakota	13	13	22
Ohio	4	4	4
Oklahoma	181	178	174
Oregon	1	1	0
Pennsylvania	10	12	13
South Dakota	0	0	5
Texas	575	628	562
S. Inland waters	8	10	6
S. Land	160	177	161
Offshore	4	3	0
North	44	64	122
Panhandle	50	53	(*)
East	44	44	(*)
West Central	‡163	‡171	183
West	102	106	90
Utah	28	30	28
Washington	1	2	1
West Virginia	4	6	4
Wisconsin	1	1	0
Wyoming	54	62	57
Total U. S.	**1,630**	1,735	1,673
Western Canada	162	161	223
Eastern Canada	0	0	5
Grand total	1,792	1,896	1,901

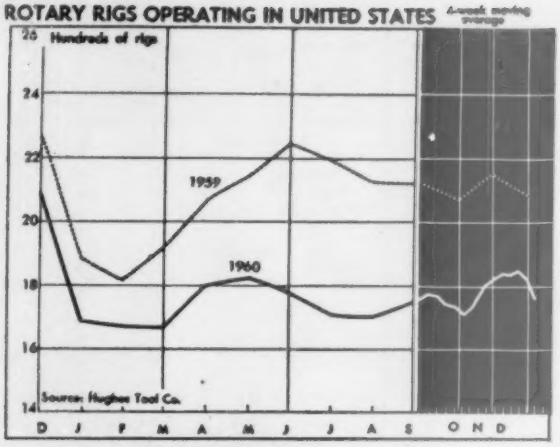
Hughes Tool Co. report. *Included in North. Comparisons not available due to change in method of reporting. †Data first reported 4-4-60. ‡Stephens and Eastland counties are now included in West Central.

WEEKLY WELL COMPLETIONS . . . WEEK ENDED JANUARY 7, 1961

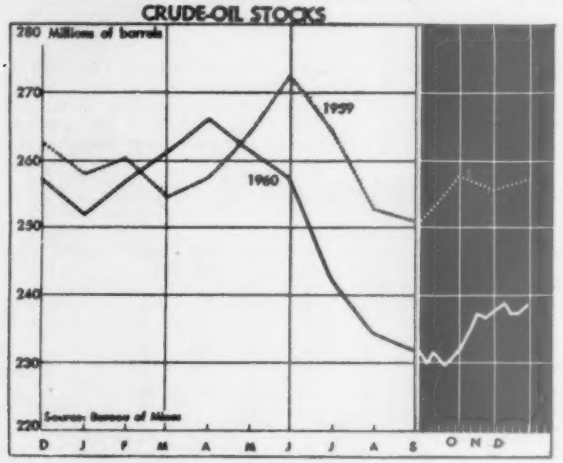
	Total wells							Cum.		Total wildcats					Cum.	
	Total	Crude	Cond.	Gas	Dry	Service	Footage	1961	1960	Total	Crude	Cond.	Gas	Dry	1961	1960
Arkansas	11	1	0	1	8	1	41,078	11	23	6	0	0	1	5	6	6
California	54	41	0	4	9	0	203,363	54	73	6	0	0	0	6	6	16
Colorado	13	4	0	2	7	0	88,611	13	16	8	1	0	0	7	8	12
Illinois	37	9	0	0	16	12	94,602	37	33	9	0	0	0	9	9	8
Indiana	21	8	0	0	13	0	31,076	21	32	4	0	0	0	4	4	8
Kansas	107	53	0	17	30	7	245,325	107	85	25	2	0	4	19	25	28
Kentucky	37	8	0	11	17	1	70,433	37	39	5	0	0	1	4	5	8
Louisiana	110	49	8	11	42	0	708,263	110	172	22	3	1	1	17	22	21
North	61	20	1	11	29	0	252,077	61	67	14	2	0	1	11	14	10
South	39	22	5	0	12	0	355,451	39	76	8	1	1	0	6	8	10
Offshore	10	7	2	0	1	0	100,735	10	29	0	0	0	0	0	0	1
Michigan	11	6	0	1	4	0	39,333	11	29	1	0	0	0	1	1	7
Mississippi	22	8	1	0	13	0	228,381	22	36	10	0	0	0	10	10	15
Montana	6	1	0	0	5	0	24,023	6	11	4	0	0	0	4	4	6
Nebraska	13	2	0	0	11	0	71,523	13	25	7	0	0	0	7	7	9
New Mexico	28	13	0	8	7	0	150,392	28	42	5	1	0	0	4	5	3
West	15	3	0	8	4	0	83,068	15	17	4	0	0	0	4	4	0
East	13	10	0	0	3	0	67,324	13	25	1	1	0	0	0	1	3
New York	59	59	0	0	0	0	78,175	59	3	0	0	0	0	0	0	2
North Dakota	5	4	0	0	1	0	22,209	5	6	0	0	0	0	0	0	1
Ohio	17	8	0	3	4	2	33,180	17	58	0	0	0	0	0	0	2
Oklahoma	105	44	0	11	32	18	340,115	105	94	11	4	0	0	7	11	21
Pennsylvania	0	0	0	0	0	0	0	0	6	0	0	0	0	0	0	2
Texas	319	160	32	13	104	10	1,386,154	319	549	58	4	1	1	52	58	136
Dist. 1	14	7	1	0	6	0	53,233	14	65	4	0	0	0	4	4	28
Dist. 2	17	3	9	0	5	0	120,309	17	43	0	0	0	0	0	0	11
Dist. 3	32	7	10	4	11	0	255,862	32	69	8	1	1	1	5	8	17
Dist. 4	24	9	3	0	12	0	136,238	24	107	7	0	0	0	7	7	28
East	37	20	4	0	12	1	175,957	37	57	8	0	0	0	8	8	14
Dist. 7-B	58	29	0	5	23	1	154,177	58	33	11	0	0	0	11	11	12
West	59	35	2	1	16	5	263,288	59	92	11	0	0	0	11	11	13
Dist. 9	46	26	1	0	16	3	104,630	46	73	8	3	0	0	5	8	11
Dist. 10	32	24	2	3	3	0	122,460	32	10	1	0	0	0	1	1	2
Utah	3	1	0	0	2	0	17,676	3	4	2	0	0	0	2	2	2
West Virginia	26	3	0	21	2	0	66,699	26	24	0	0	0	0	0	0	1
Wyoming	22	7	0	1	14	0	124,409	22	29	11	0	0	0	11	11	15
Misc. (Mo., Ala., Fla.)	9	2	0	0	7	0	66,732	9	8	6	0	0	0	6	6	7
Total U. S.	**1,035**	491	41	104	348	51	4,131,752	1,035	1,397	**200**	15	2	8	175	200	336
Previous week	644	303	5	76	239	21	2,723,663	.....	.....	99	8	0	6	85	.....	.....
Cum. 1961	1,035	491	41	104	348	51	4,131,752	.....	.....	200	15	2	8	175	.....	.....
Cum. 1960	1,397	573	88	124	575	37	6,707,730	.....	.....	336	24	6	8	298	.....	.....
Western Canada	66	35	0	15	16	0	382,071	66	185	22	0	0	3	19	22	47

PRODUCTION

ROTARY RIGS OPERATING IN UNITED STATES



CRUDE-OIL STOCKS



CRUDE-OIL STOCKS BY STATES OF ORIGIN*
(Thousands of barrels)

	12-31-60	12-24-60	1-2-60
Pennsylvania	2,208	2,279	2,283
Other Appalachian	1,152	1,304	1,492
Illinois, Indiana, Michigan	8,599	8,749	10,108
Nebraska and North Dakota	2,678	2,705	3,245
Kansas	8,762	9,070	9,688
Oklahoma	15,527	15,982	16,916
Arkansas	2,005	1,771	2,240
Louisiana	20,148	18,798	17,942
North	3,011	3,003	3,297
South	17,137	15,795	14,645
Mississippi, Alabama, Florida	1,840	1,943	2,577
New Mexico	7,749	7,749	8,049
Texas	101,903	100,418	109,650
East Texas	7,728	7,517	8,056
West Texas	46,424	45,363	51,343
Texas Gulf	18,320	18,793	20,589
Other Texas	29,431	28,745	29,662
Wyoming	17,150	17,279	16,795
Other Rocky Mountain	10,113	9,970	9,627
California	25,314	26,083	28,792
Foreign	†13,584	12,832	13,496
Total	**238,732**	236,932	252,900

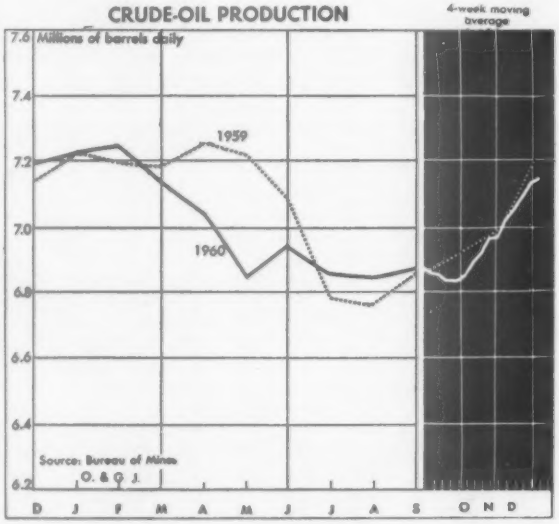
*Bureau of Mines. †Includes 4,727,000 bbl. in California

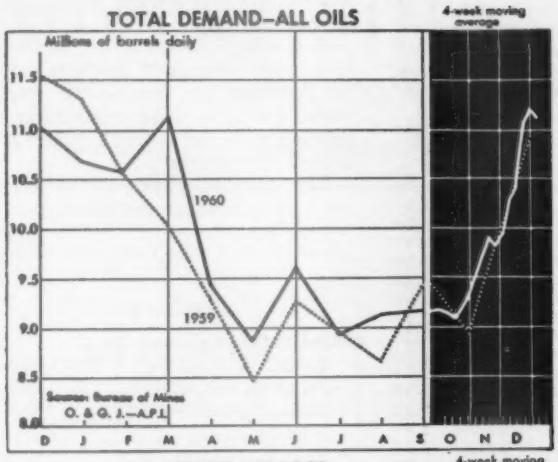
DAILY AVERAGE PRODUCTION FOR WEEK

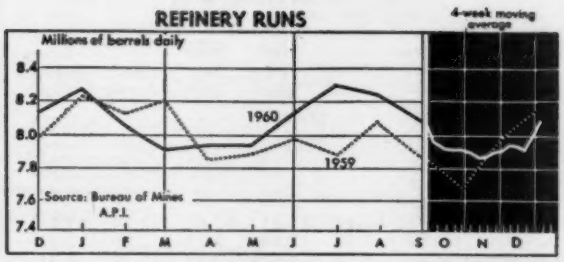
	January 7, 1961			Dec. 31
	Crude oil	Lease condensate	Total	total
Alabama	21,000	.....	21,000	21,200
Alaska	6,475	.....	6,475	5,125
Arkansas	74,770	130	74,900	74,550
California	835,300	.....	835,300	835,000
Colorado	132,700	.....	132,700	132,000
Eastern	33,600	.....	33,600	37,000
Florida	1,000	.....	1,000	875
Illinois	216,000	.....	216,000	220,300
Indiana	32,700	.....	32,700	32,800
Kansas	†294,270	.....	†294,270	†298,100
Kentucky	59,200	.....	59,200	59,100
Louisiana	981,900	137,900	1,119,800	1,103,800
North	103,900	5,400	109,300	110,800
South	878,000	132,500	1,010,500	993,000
Michigan	48,400	.....	48,400	48,500
Mississippi	146,800	4,150	150,950	150,875
Montana	80,500	.....	80,500	81,000
Nebraska	65,000	.....	65,000	64,700
Nevada	100	.....	100	100
New Mexico	285,000	8,200	293,200	300,500
North Dakota	70,600	.....	70,600	71,000
Oklahoma	†517,400	.....	†517,400	†548,000
Texas	2,512,000	97,850	2,609,850	2,590,000
Dist. 1	42,000	3,700	45,700	47,200
Dist. 2	106,000	8,600	114,600	116,300
Dist. 3	321,000	39,000	360,000	358,350
Dist. 4	179,000	15,000	194,000	191,200
Dist. 5	27,000	500	27,500	27,500
Dist. 6	112,000	10,000	122,000	118,800
East Texas field	133,000	.....	133,000	133,000
Dist. 7-B	127,000	400	127,400	123,400
Dist. 7-C	115,000	3,550	118,550	120,150
Dist. 8	1,056,000	12,000	1,068,000	1,051,400
Dist. 9	193,000	2,500	195,500	201,000
Dist. 10	101,000	2,600	103,600	101,700
Utah	109,700	.....	109,700	108,900
Wyoming	380,700	.....	380,700	382,000
Others	‡750	.....	‡750	‡750
Total U. S.	6,905,865	248,230	**7,154,095**	7,166,175
Change from previous week, down			**12,380**	
Canada	†518,700	.....	†518,700	†532,000
Total U. S. prod.—Jan. 1-Jan. 7				50,078,665 bbl.
Same period last year (crude plus cond.)				*50,430,400 bbl.

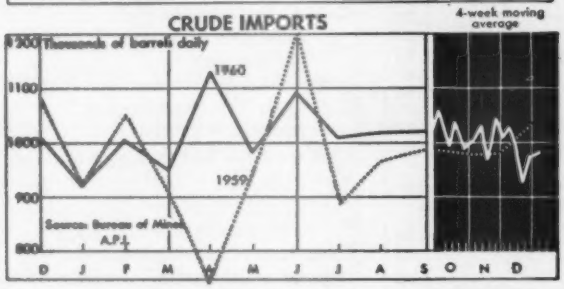
*Includes 1,511,400 bbl. condensate. †Week ended previous Monday. ‡South Dakota and Arizona.

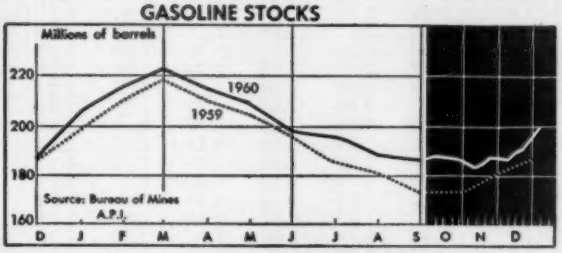
CRUDE-OIL PRODUCTION

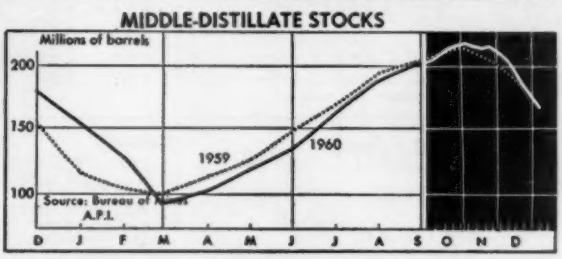


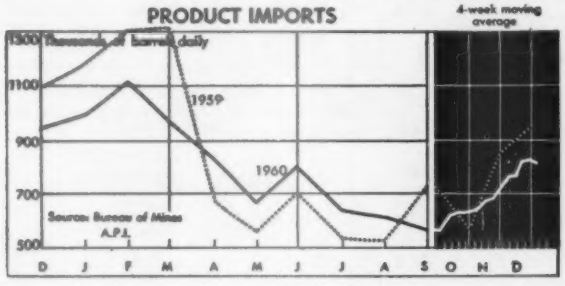

TOTAL DEMAND—ALL OILS
Millions of barrels daily
4-week moving average
1960
1959
Source: Bureau of Mines
O. & G. J.—A.P.I.
D J F M A M J J A S O N D

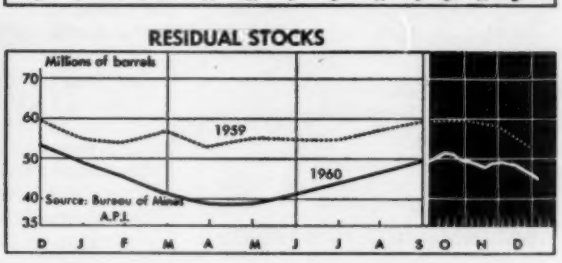












API REFINERY REPORT—JANUARY 6, 1961

(Thousands of barrels)

District—	Daily avg. runs	Daily average production: Gaso.*	Kero.	Dist.	Resid.	Stocks‡: Gaso.†	Kero.	Dist.	Resid.	Bureau of Mines, January 1960: Daily avg. runs	Daily average production: Gaso.*	Kero.	Dist.	Resid.
East Coast	1,099	506.1	41.4	367.3	158.1	44,322	11,963	50,628	12,778	1,123	493.3	39.9	322.2	160.7
Appalachian:														
District 1	104	42.7	6.1	22.3	14.7	5,598	740	3,493	535	103	39.3	4.0	23.5	15.5
District 2	101	56.3	6.4	21.3	13.1	2,895	392	1,648	376	108	54.6	7.9	20.8	17.4
Ind., Ill., Ky.	1,534	783.7	85.2	364.8	184.6	33,128	6,231	23,191	6,202	1,569	801.6	82.2	364.0	238.1
Minn., Wis., Dak.	129	64.3	3.1	29.3	21.4	6,912	1,185	6,924	597	125	59.9	7.5	26.6	21.7
Okla., Kans., Mo.	764	410.0	17.7	182.7	24.7	17,540	1,204	12,018	949	761	411.5	15.7	206.8	31.4
Inland Texas	292	229.1	9.7	47.1	19.0	7,048	627	1,615	2,511	302	211.1	10.9	52.3	22.6
Texas Gulf Coast	1,950	1,017.9	180.9	470.6	142.7	30,367	3,338	12,033	5,220	1,937	974.5	150.1	487.6	158.8
La. Gulf Coast	603	326.0	74.7	131.1	38.6	11,449	1,949	4,771	1,149	691	362.1	78.9	151.3	53.9
N. La. and Ark.	108	52.0	3.4	27.3	6.0	5,262	1,084	3,065	154	103	71.5	6.8	22.5	8.7
Rocky Mountain:														
New Mexico	19	11.6	0.4	3.9	2.6	955	45	135	16	24	13.4	0.1	4.4	2.3
Other	297	151.7	6.7	62.4	31.4	6,380	488	2,668	1,081	297	142.5	3.3	69.3	35.5
West Coast	1,167	539.0	43.0	165.9	295.7	28,069	1,598	13,043	13,423	1,136	548.4	29.7	180.1	280.2
Jan. 6, 1961	8,167	4,190.4	478.7	1,896.0	952.6	199,925	30,844	135,232	44,991	8,279	4,183.7	437.0	1,931.4	1,046.8
Dec. 30, 1960	8,245	4,294.0	458.1	1,958.1	958.0	195,703	32,048	142,246	46,092	.....	.....	.....	.....	.....
Jan. 8, 1960	8,396	4,175.7	390.1	1,974.4	1,034.3	193,948	26,852	144,134	52,358	.....	.....	.....	.....	.....

*At refineries including natural blended. †Finished and unfinished. ‡At refineries, bulk terminals, in transit, and pipelines.

Crude-Oil Prices

GRAVITY SCHEDULE

	Signal Hill, Calif.	Okla-homa	West Tex. (sour)	West Tex. (Inter.)	No.* Texas	Texas Refugio Light	Bayou Sale (La.)	Denver Jules-burg	Wyo. (sour)
14-14.9	$1.86	....	....	....	....	....	....	....	....
15-15.9	1.93	....	....	....	....	....	....	....	1.81
16-16.9	2.00	....	....	....	....	....	....	....	1.86
17-17.9	2.06	....	....	....	....	....	....	....	1.96
18-18.9	2.13	....	....	....	....	....	....	....	1.96
19-19.9	2.20	....	....	....	....	....	....	....	2.01
20-20.9	2.27	$2.49	$2.35	$2.61	$2.29	$2.95	$2.90	$2.58	2.06
21-21.9	2.33	2.52	2.38	2.63	2.33	2.97	2.92	2.60	2.11
22-22.9	2.40	2.55	2.41	2.65	2.37	2.99	2.94	2.62	2.16
23-23.9	2.46	2.58	2.44	2.67	2.41	3.01	2.96	2.64	2.21
24-24.9	2.53	2.61	2.47	2.69	2.45	3.03	2.98	2.66	2.26
25-25.9	2.60	2.64	2.50	2.71	2.49	3.05	3.00	2.68	2.31
26-26.9	2.67	2.67	2.53	2.73	2.53	3.07	3.02	2.70	2.36
27-27.9	2.74	2.70	2.56	2.75	2.57	3.09	3.04	2.72	2.49
28-28.9	2.81	2.73	2.59	2.77	2.61	3.11	3.06	2.74	2.54
29-29.9	2.87	2.76	2.62	2.79	2.65	3.13	3.08	2.76	2.59
30-30.9	2.93	2.79	2.65	2.81	2.69	3.15	3.10	2.78	2.63
31-31.9	3.00	2.82	2.68	2.83	2.73	3.17	3.12	2.80	2.67
32-32.9	3.06	2.85	2.71	2.85	2.77	3.19	3.14	2.82	2.71
33-33.9	3.12	2.88	2.74	2.87	2.81	3.21	3.16	2.84	2.75
34-34.9	3.17	2.91	2.77	2.89	2.85	3.23	3.18	2.86	2.79
35-35.9	3.22	2.94	2.80	2.91	2.89	3.25	3.20	2.88	2.83
36-36.9	3.27	2.97	2.83	2.93	2.93	3.27	3.22	2.90	2.87
37-37.9	3.31	2.99	2.86	2.95	2.95	3.29	3.24	2.92	2.89
38-38.9	....	3.01	2.89	2.97	2.97	3.31	3.26	2.94	2.91
39-39.9	....	3.03	2.92	2.99	2.99	3.33	3.28	2.96	2.93
40-44.9	....	3.05	2.95	3.01	3.01	3.35	3.30	2.98	2.95

*Cooke, Grayson, Montague.

Flat Prices

Louisiana:
- Sweet Lake $3.00

Texas:
- East Texas 3.05-3.25
- Conroe 3.23-3.53
- Van 3.08

Pennsylvania Grade:
- Bradford $4.75-4.80
- Middle District 4.52
- Southwest Pennsylvania 4.25
- West Virginia 4.17
- Buckeye Grade 4.08

Illinois Basin 3.00-3.05

Foreign

Middle East, Persian Gulf: (cargoes f.o.b. lifting port)
- Arabian, 34.0°-34.9°, Ras Tanura $1.80
- Iranian, 34.0°-34.9°, Bandar Mashur 1.78
- Iranian, 34.0°-34.9°, Abadan 1.73
- Iraq, 35.0°-35.9°, Fao 1.72
- Kuwait, 31.0°-31.9°, Mina-al-Ahmadi 1.59
- Qatar, 41.0°-41.9°, Umm Said 1.95

Middle East, E. Mediterranean:
- Arabian, 34.0°-34.9°, Sidon $2.17
- Iraq, Mosul-Kirkuk, 35.0°-35.9°, Tripoli 2.19

Far East (cargoes, f.o.b. Lutong, Sarawak):
- Seria Light, 36° 2.42

Canada:
- Leduc-Woodbend $2.53
- Redwater (Alta.) 2.42
- Weyburn (light) 2.06
- Midale C 1.69

Venezuela:
- Cumbarebo, 47°-47.9°, Tucupido 3.34
- San Joaquin, 40°-40.9°, Puerto La Cruz 3.08
- Oficina, 35°-35.9°, Puerto La Cruz 2.80
- Tia Juana medium, 26°-26.9°, Amuay* 2.30
- Quiriquire, 16.0-16.4°, Caripito 2.10
- Lagunillas heavy, flat, Las Piedras* 2.10
- Bachaquero, flat, 15°-16°, Las Piedras* 1.88

Prices for all crudes of 24° or lighter vary 2 cents per degree change, up or down. All crudes heavier than 24° vary 2.5 cents per half-degree gravity change.

*Also available at La Salina at 3 cents per barrel less.

Tanker Rates (Long Ton)

(Latest reported spot fixtures)

- ★ Gulf-NY, clean (ATRS+35%) $3.85
- ★ Gulf-NY, dirty (ATRS+12.5%) 3.21
- ★ Carib.-NY, dirty (ATRS—45%) 1.49
- ★ PG-UK, dirty (Scale—42.5%) (34s. 6d.) 4.83
- ★ PG-Japan, dirty (USMC—60%) 4.32

★Denotes change from previous week

Refined-Product Prices

Following quotations are realistic spot prices for refined products moving interstate on Wednesday each week. They may differ from refiners' posted prices and should not be considered as postings.

Light-product prices are in cents per gallon. Residual and crude prices are dollars per barrel. Crude prices are at the well unless otherwise listed.

Gasoline*

Mid-Continent (Group 3):
- Regular (91 octane) 12.25-12.50
- Premium (99 octane) 15.00-15.25
- Natural gasoline (26-70) 4.5
- Breckenridge 4.0

Gulf Coast (cargoes for coastwise or export movements):
- Regular (90 octane) 11.00
- Regular (92 octane) 11.25
- Premium (98 octane) 12.25

California (rack) Los Angeles:
- ★ Regular (90 octane) 11.30
- ★ Premium (95 octane) 12.30
- ★ Premium (100 octane) 13.80

Caribbean area (cargoes):
- Regular (87 octane) 10.125-10.25
- Premium (97 octane) 11.75

*Quotations are for octanes shown. Prices usually vary with octane ratings within the regular, premium, and aviation grades.

Kerosine and Distillate

Mid-Continent (Group 3):
- Kerosine 42-44 ..... 10.875
- Diesel oil (58 d.i. and above) 10.50
- Distillate No. 1 ..... 10.50
- Distillate No. 2 ..... 9.50

Gulf Coast (cargoes):
- ★ Kerosine 41-43 ..... 9.5-9.75
- ★ Distillate No. 2 ..... 8.75-9.00

New York Harbor (barges):
- Kerosine 42-43 ..... 11.15
- Distillate No. 2 ..... 10.15
- Diesel fuel, 48-52 d.i. 10.55

Caribbean area (cargoes):
- Distillate No. 2 ..... 8.125

Residual Fuel (Bbl.)

Mid-Continent (Group 3):
- Residual fuel (max 1% S) $1.90

Gulf Coast (cargoes):
- Bunker C fuel 2.30

New York Harbor (barges):
- Bunker C fuel 2.52

Caribbean (cargoes):
- Bunker C 2.10

California (rack):
- Bunker C fuel, Los Angeles 2.25

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Phone JA 3-4621

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2,000,000 ft.	2"	3.50# to the ft.
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1,000,000 ft.	4"	10.98#
500,000 ft.	6"	19.80#
200,000 ft.	8 5/8"	28#
400,000 ft.	10¾"	35#
75,000 ft.	12¾"	40#
50,000 ft.	18"	59#

All No. 1 Grade Plain end and cleaned.

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Oklahoma City 14, Oklahoma
or phone VIctor 3-6683

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UNUSED — CONDITION PERFECT
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Lombard Model 4WH Pump, 6" Suction 4" Discharge
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9.7 MM BTU/hr. Duty CHROME Tubes
9 MM BTU/hr. Duty Carbon Tubes
7.5 MM BTU/hr. Duty CHROME Tubes (2)
5 MM BTU/hr. Duty Carbon Tubes
2.5 MM BTU/hr. Duty Carbon Tubes
2 MM BTU/hr. Duty Carbon Tubes

CENTRIFUGAL BLOWER NEW 1954

7,500CFM @ 14.4PSIG SUCTION 42.5PSIG DISCH.

Multi-Stage 8025 RPM driven by 1250 HP Synchronous Motor 3/60/2300/1200 RPM, 5 KW Direct Conn. Exciter, Falk Speed Increaser 6.70:1 Ratio, Precooler, Intercooler, Aftercooler, NEW 1954.

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11,000 ft. 3½" O.D., Rng. 2, Grade D, Square Shoulder Shrink Grip Drill Pipe. 4¾" Tool Joints. Checked and Graded No. 2.

5¼" O.D. Drill Collars—2⅛" bore. Lifting Type Thread Protectors. With or without hard band. Many like new.

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All applicantions wil be treated in confidence.

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Attention: John Sibole
326 National Bank of Tulsa Building
Tulsa, Oklahoma **Phone: LUther 5-9161**

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Substantial publicly owned corporation servicing oil industry is establishing new department at East Coast headquarters to expand and diversify its operations in oil and natural gas industries. Interested in engaging Assistant Manager thoroughly versed in and with contacts in these industries. Replies should include age, education, experience and salary requirements. Our employees know of this ad. Replies confidential. Box M-217, The Oil and Gas Journal, Tulsa, Oklahoma.

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For immediate employment. Job requires proof of U. S. citizenship, 3 to 5 years HCC or TCC experience at responsible level. No helpers or trainees desired. These are SUPERVISORY jobs ONLY and salaries are commensurate.

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LANDMAN 20 years majors and independents, west, south, coastal Texas, four corners, Louisiana, Mississippi, 43 years old. Married. Go anywhere. Box M-233, The Oil and Gas Journal, Tulsa, Oklahoma.

DESIRE OPPORTUNITY to prove my worth in drilling, producing, management, sales. Petroleum Engineer. 15 years Gulf Coast experience. Box M-232, The Oil and Gas Journal, Tulsa, Oklahoma.

GAS ENGINEER, 12 years all phases, design and construction field systems, transmission lines, dehydration, liquid recovery, compression, contract negotiations, FPC filings, measurement, testing, corrosion, economic evaluations and income improvement. Sober, industrious, capable. Can manage gas operations for small integrated or large independent producer or gas company. Want responsibility. Will relocate. Box M-236, The Oil and Gas Journal, Tulsa, Oklahoma.

SITUATIONS WANTED

GEOPHYSICIST with twenty-one years of seismic reflection experience, mostly in Latin America, seeks employment. Write Douglas F. Warner, 867 Phillips Street, South Haven, Michigan.

PETROLEUM GEOLOGIST, B. S. in Geology, 12 years U. S. experience, 5 Middle East, 1 year South America, wants work. Box M-220, The Oil and Gas Journal, Tulsa, Oklahoma.

AVAILABLE NOW—manager for independent producer, 44. Supervise all accounting, budgetary, finance functions and prepare tax returns. Field experience production and waterfloods. Box M-226, The Oil and Gas Journal, Tulsa, Oklahoma.

AMERICAN, RETIRED executive of major oil company, excellent health, 43 years experience in Brazil in administration organization and sales. Valuable contacts local producers and refiners. Interested as part-time local representative supplier of crude oil, petrochemicals, or allied lines. Write Box M-231, The Oil and Gas Journal, Tulsa, Oklahoma.

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DRILLING OR PETROLEUM Engineer: 11 years varied domestic and foreign experience in engineering, as a toolpusher, and supervisor. Two degrees in engineering. Speak fluent Spanish. Desire domestic or foreign employment. Box M-235, The Oil and Gas Journal, Tulsa, Oklahoma.

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BOOKS

AAPG BULLETINS for Sale: Complete set beginning with Vol. 5, No. 1, Jan., 1921. Box M-228, The Oil and Gas Journal, Tulsa, Oklahoma.

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OIL FIELD TOOLS and equipment sales representation for American manufacturers. Offered for Italy and North Africa especially, by Italian engineer, retiring from large company. Highest references. Italy and U. S. Address: Box 31 R 961, The Oil and Gas Journal, 4041 Marlton Ave., Los Angeles 8, California.

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LEASE AND DRILLING BLOCKS

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OIL LEASE CRANE County, Texas: Available S/239 acres, Section 18, Block B-28, PSL, two miles from new gas discovery Section 23, Blk. 4, H&TC, Hill & Meeker well. Quick action, address landowner: Jefferson G. Smith, 715 Littlefield Building, Austin 15, Texas.

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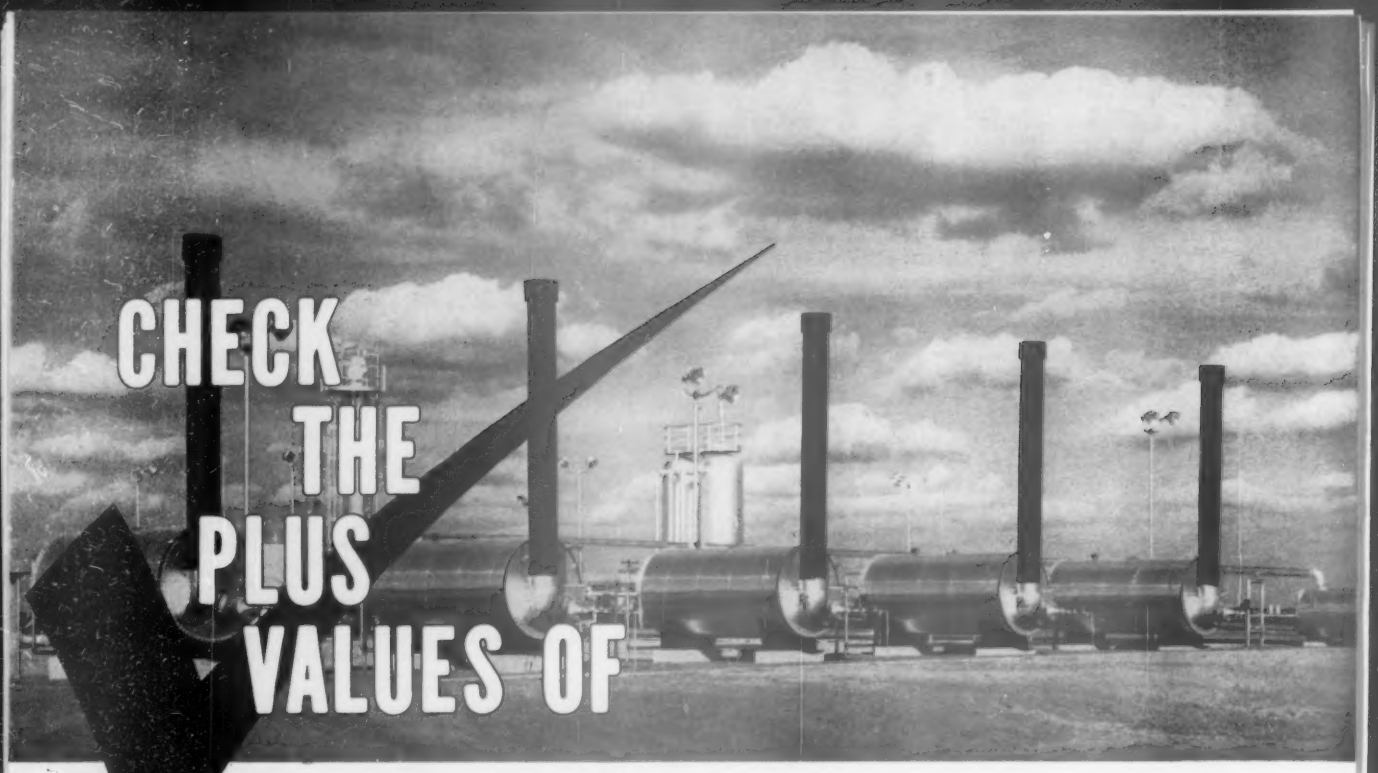
Box M-227
The Oil and Gas Journal
Tulsa, Oklahoma

ADVERTISERS . . . in this issue

ACF Industries, Incorporated, W-K-M Division 19
Ajax Iron Works 13
Allen-Bradley Co. 28
Anderson Company, The V. D. 38
Atlas Pipe Inc. 55
Babcock & Wilcox Company—Tubular Products Division, The 40
Baker Oil Tools, Inc. 42
Bethlehem Steel Company 113
Black, Sivalls & Bryson, Inc. 30
Braniff International Airways 99
Brown & Sharpe Mfg. Co. 25
C-B Southern, A Division of The Cooper-Bessemer Corporation 10-5
Classified Advertising 139, 140
Colorado Fuel and Iron Corp. 118
Continental Oil Co. 39
Cook Company, C. Lee 102
Cooper-Bessemer Corp., The 114, 115
De Laval Steam Turbine Company 10, 11
Dover Corporation—W. C. Norris Division 110, 129
Dow Corning Corporation 22
Dowell 67, 117
du Pont ..... 17, 18, Inside Back Cover
Electric Machinery Mfg. Company 14
Ethyl Corporation 88, 89
Federal-Mogul Service Division of Federal-Mogul-Bower Bearings, Inc. 16
First National Bank of Shreveport, The 128
Fischer & Porter Company 91
Fisher Governor Company 100, 101
Ford Motor Company 120, 121
Gates Rubber Co., The 87
Gillespie and Sons, Inc., Glenn 129
Goodrich Chemical Company, B. F.—(GEON) 7
Goodyear Industrial Products Division 2, 3
Gorman-Rupp Company, The 111
Guiberson Corporation 8
Halliburton Company 4, 5, 63
Hartzell Propeller Fan Co., Division of Castle Hills Corp. 108
Henson, Kenneth W. 96
Hoke, Incorporated 9
Huey & Co., S. E. 96
Hughes Tool Co. ..... Back Cover
Kano Laboratories 128
Koppers Company, Inc., ... 37
Lane-Wells Company ..... Inside Front Cover
Larkin Packer Company, Division—Koerting Company 83
Lone Star Steel Company 94, 95
Lufkin Rule Co., The 106
Lukens Steel Company 31
Martin, Manufacturer, John N. 117
Minneapolis-Honeywell Regulator Co., Industrial Division 32, 33
Mission Mfg. Company 36
National Tank Company 142
Norris, W. C., Division of Dover Corporation 110, 129
Oil Well Supply Division 15
Otis Engineering Corporation 29
Petroleum Electric Power Assn. 6
Rector Well Equipment Co., Inc. 12
Republic Rubber Division of Lee Rubber & Tire Corp. 116
Rockwell Manufacturing Company 109
Stearns-Roger Mfg. Co., The 44
Taylor Instrument Companies 26, 27
Templeton, Kenly & Co. 96
United States Steel Corporation 20, 21
Oil Well Supply Division 15
Vogt Machine Co., Henry 23
Walworth Co. 1
Warner Lewis Company 34
Well Equipment Mfg. Corp. 24
W-K-M Division of ACF Industries Incorporated 19



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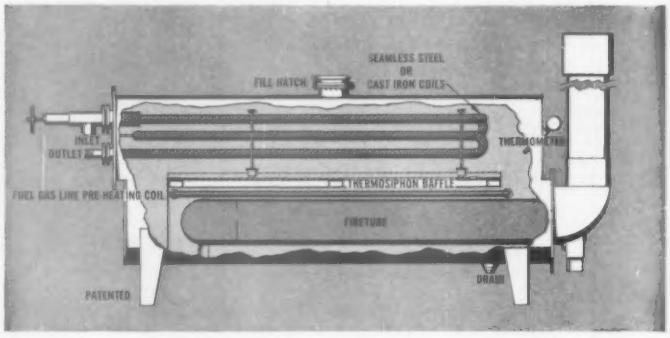

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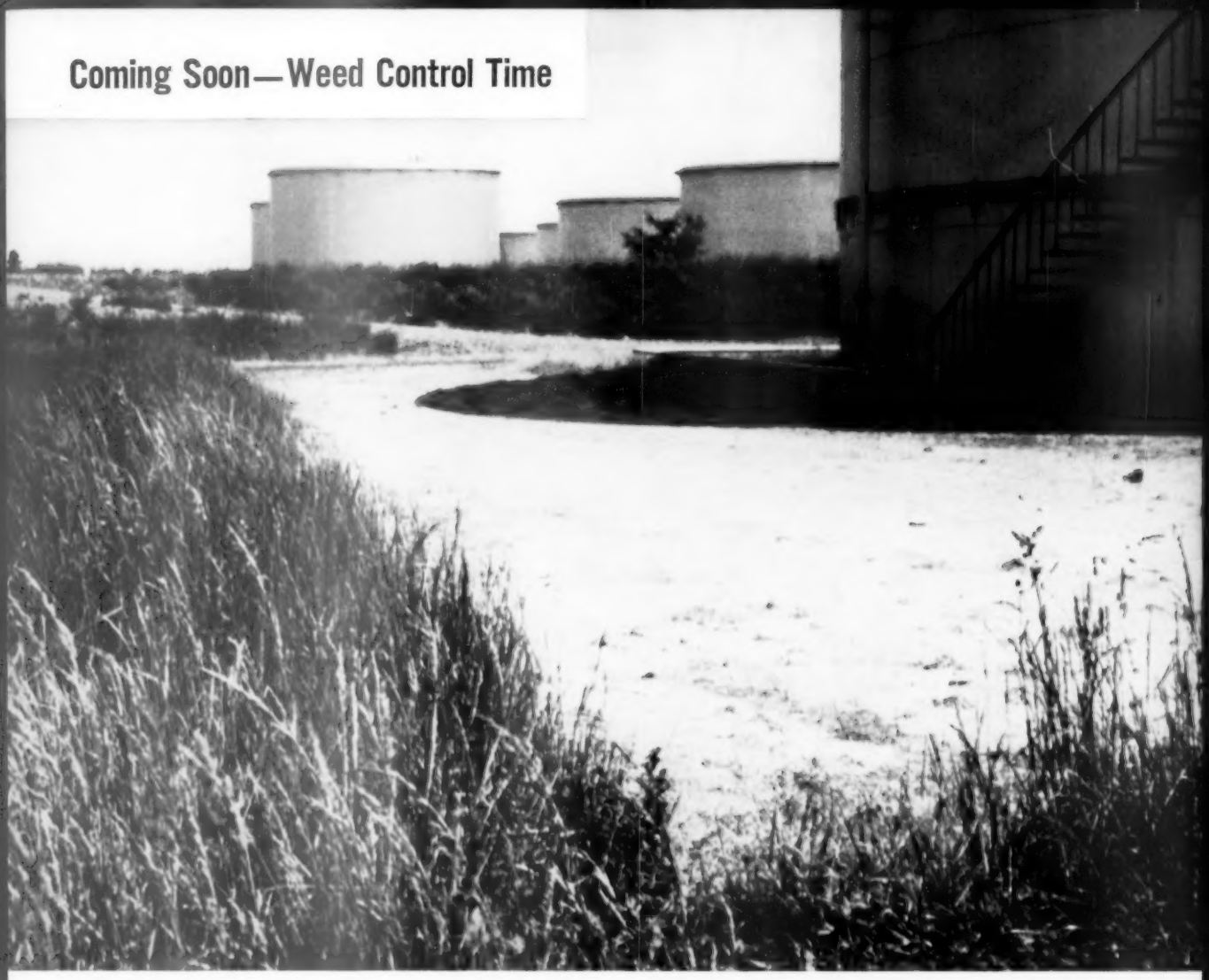

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